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AND

REGISTER OF INVENTIONS AND IMPROVEMENTS.

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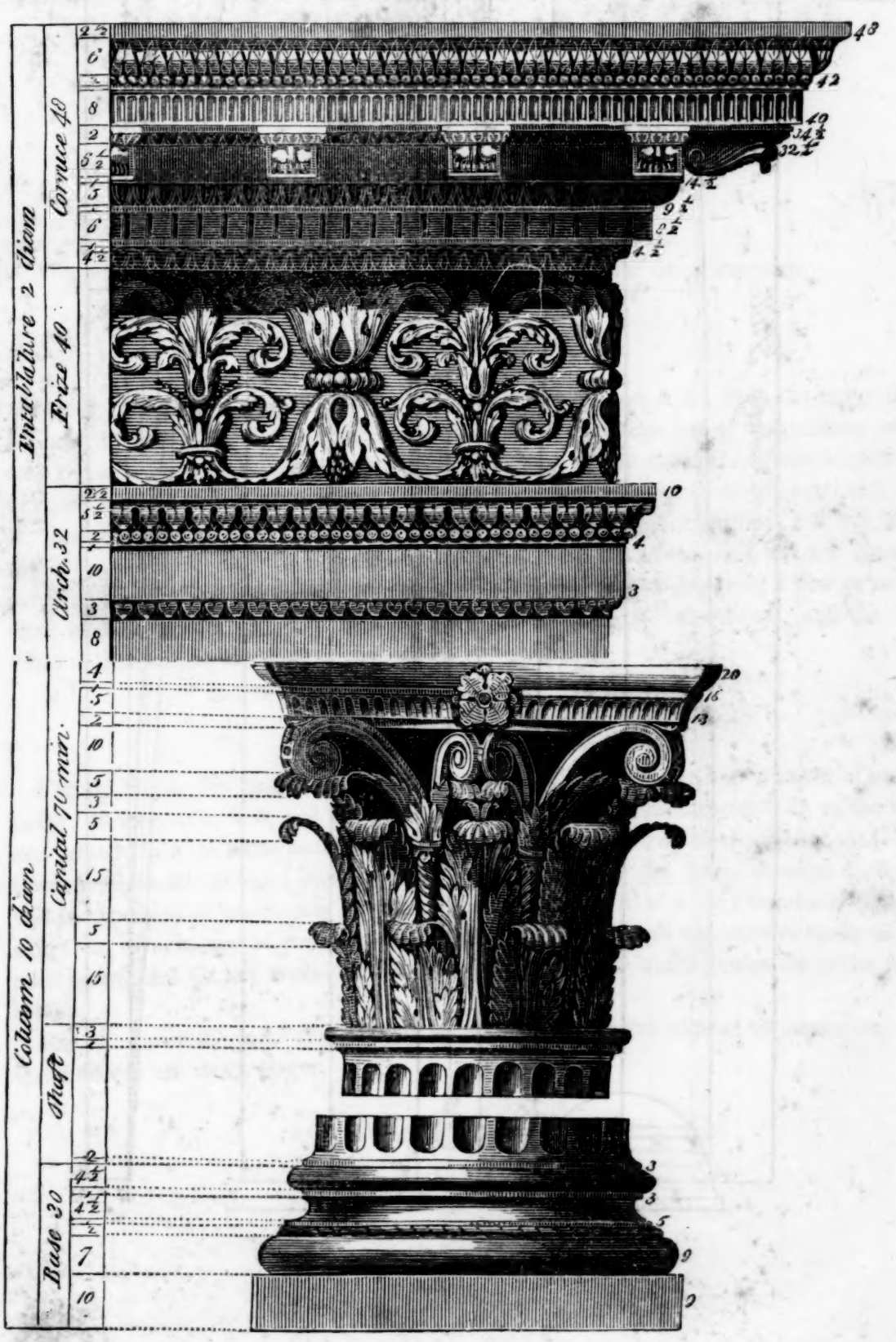


Plate 4.

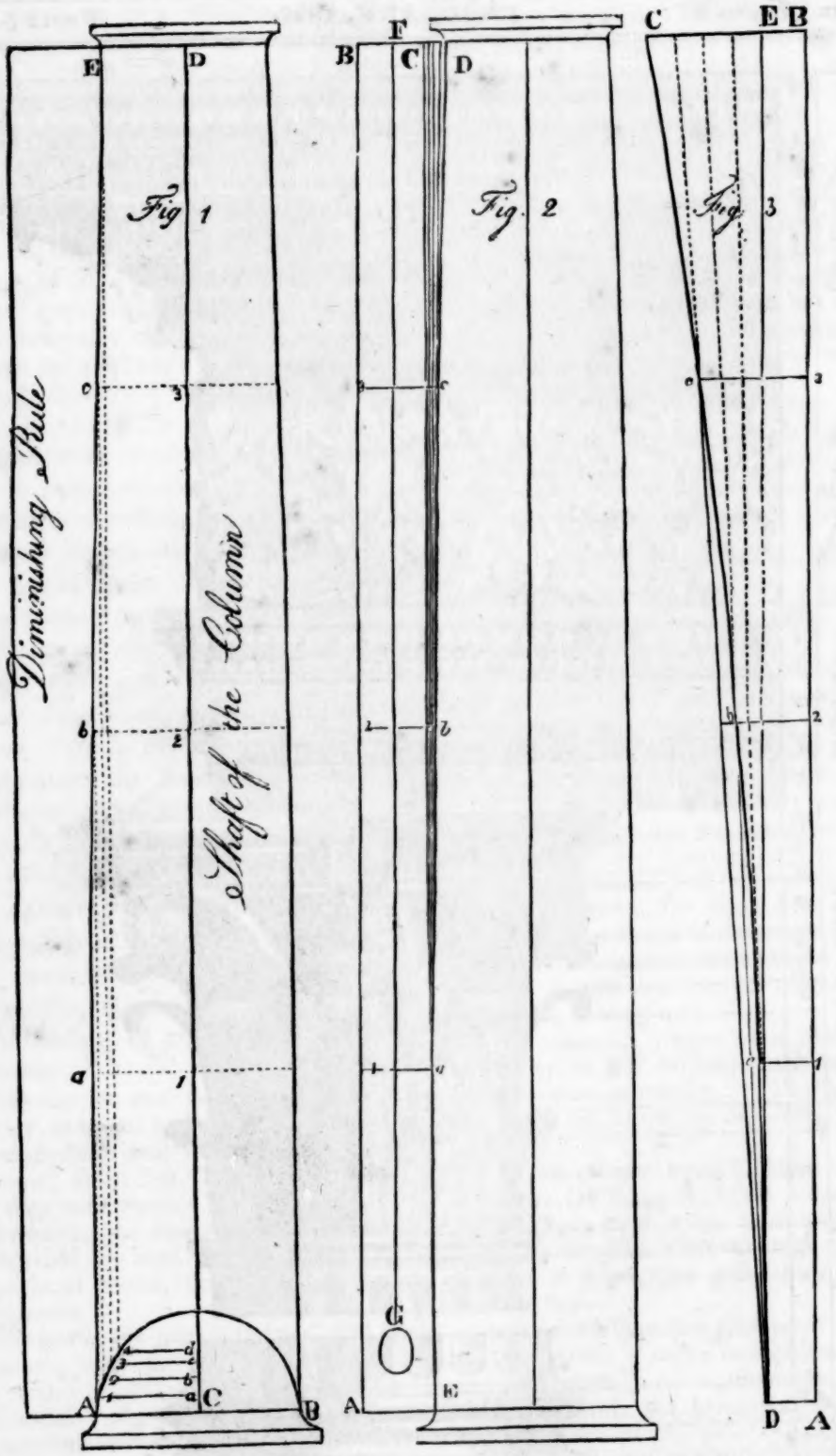


Fig 1
Diminishing Rule
Shaft of the Column
E
D
A
C
B
Fig. 2
F
B
C
D
G
A
Fig. 3
C
E B
D A

THE STUDENT'S INSTRUCTOR

IN DRAWING AND WORKING

THE FIVE ORDERS OF ARCHITECTURE.

BY PETER NICHOLSON, ARCHITECT.

(Continued from our last.)

PLATE IV.

TO MAKE A RULE FOR DIMINISHING THE SHAFT OF A COLUMN.

Method 1.

Fig. 1. Describe a semicircle, on the bottom of the column A B; from the top of the column, draw the line E 4, parallel to the axis D C, or middle line of the column, cutting the semicircle at the base in 4; divide the arc A 4, into four, or any other number of equal parts, and divide the height C D, into the same number of equal parts, as 1, 2, 3; through the divisions 1, 2, 3, 4, of the semicircle at the base, draw lines 1 *a*, 2 *b*, 3 *c*, and 4 *d*, parallel to A B; set off those parts from each side of the axis, on the corresponding numbers on the shaft; then by bending a thin lath or slip, round pins or nails fixed in these points, you will have the contour, or curve of the column: and the reverse of this will be the edge of the rule for working it by.

Method 2.

Fig. 2. Divide the height of the diminishing rule, as A B, into any number of equal parts; as four, at 1, 2, 3, and divide the difference of the semidiameter C D, at the top and bottom, into the same number, viz. four, and draw lines from each division on C D, towards E, at the bottom; cutting lines drawn parallel to the base, through 1, 2, 3, will give points, by which you may draw as before, a curve of a very regular and pleasing form, which may be drawn on the edge of the rule, or on the column itself, as is most convenient for the workman; this, in my opinion, is much preferable to the first method.

Fig. 3. shows the same thing not in its just proportion but clearer to inspection, as the divisions are much larger.

TO DRAW THE FLUTES OF COLUMNS.

Plate 5.

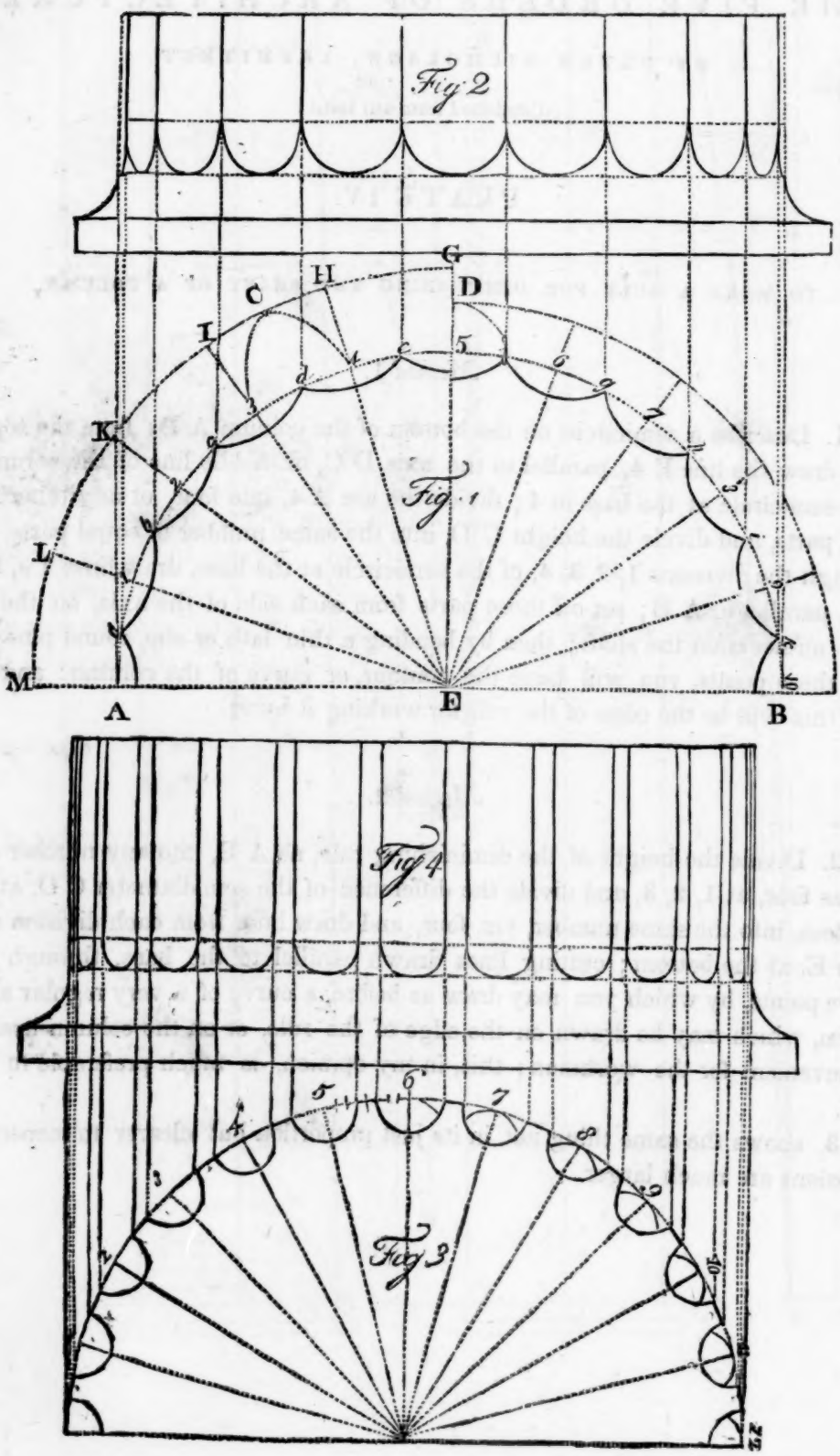


PLATE V.

TO DRAW THE FLUTES OF COLUMNS.

To draw the Flutes of the Doric Column.

On A B, Fig. 1, the diameter of the column, describe a semicircle, and divide the semicircle into ten equal parts; (as the Doric column usually contains twenty flutes, which are in general made shallow, and without fillets;) through every two of the divisions draw lines E 1, E 2, E 3, E 4, to E 10, between any two divisions, (as 3 and 4,) describe two arcs whose vertex is C: on E with a radius E C, describe the quadrant G, H, I, K, L, M, cutting the lines E A, E 1, E 2, E 3, E 4, &c., in the points, G, H, I, K, L, M, which are the centres for the flutes; but if the flutes are wanted deeper, you may make the distance 5 D, half the breadth of a flute; and proceed as shown on the other quadrant, and from *a*, *b*, *c*, &c., draw perpendiculars to the bottom of the column.

Fig. 2. *The Ionic, Corinthian, and Composite Orders,*

Have in general twenty-four flutes, with a fillet between each; (the fillet one-third of a flute;) in order to have that number, and preserve the just proportion of a flute to a fillet, observe the following rule: divide the semicircumference, Fig 3, into twelve equal parts, at 1, 2, 3, 4, 5, &c., to 12, divide any division into eight equal parts, as that between 5 and 6, then take three of these parts, and on 1, 2, 3, &c. to 12, as centres, describe arcs which are nearly semicircular as in the plate, and then draw them to the column, Fig. 4.

TO DRAW THE FLUTES AND FILLETS ON THE SHAFT OF A COLUMN.

Plate 6.

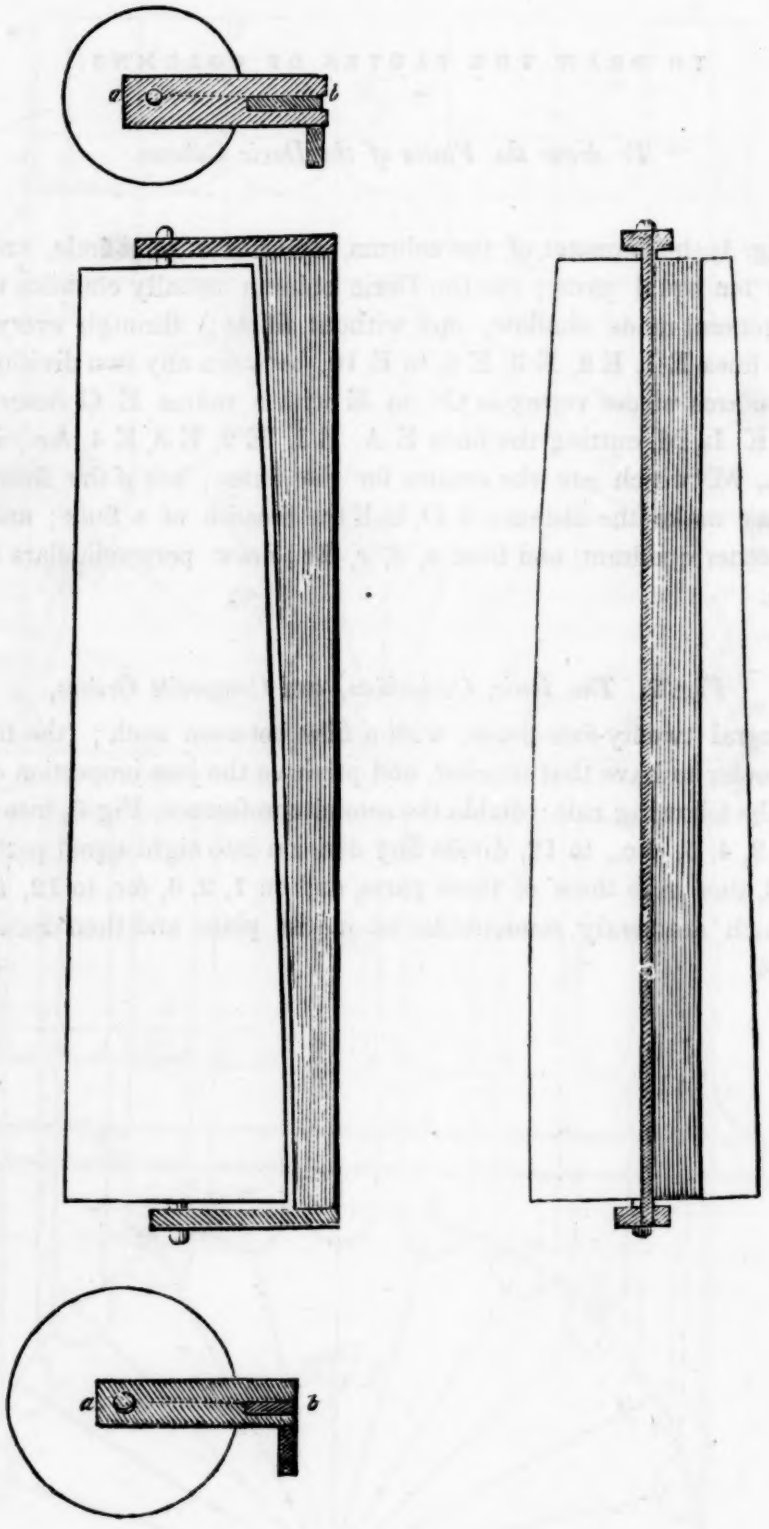


PLATE VI.

TO DRAW THE FLUTES AND FILLETS ROUND THE SHAFT OF A COLUMN.

If the columns are of stone, or wood, the whole or any part may be fluted in the following manner: after being properly rounded, and the ends or joints made parallel to each other, find the centres of the circles at each end; and if they are not already found, cut two holes, directly in the middle at each end perpendicular to the joints, so that the centre shall be in the middle of the holes; this being done, drive in two pieces of wood, so as to be quite tight in the holes, and to project out about five or six inches; let the projecting parts be well rounded off, so as to be exactly in the middle of the ends, then make a diminishing rule as in Plate IV. To fit the curve of the column, let the ends of this diminishing rule be fixed into two pieces, *a b;* which are made to revolve round the pins at the ends by means of notches, or any other convenient way; so that the curved edge of the rule be very near to the curved surface of the column, and one side of the rule to tend exactly to the centre: to keep the rule steady from bending sideways, fix a rule to the other side, the whole length of the diminishing rule, of a sufficient strength to keep the diminishing rule from bending; so that the breadths of the two rules will be at right angles to each other, the two end pieces and diminishing rule being fixed fast together; the whole may be turned round the pins at the ends as centres, like one entire piece: then the operation of drawing the flutes and fillets will be as follows: suppose it were required to flute the Ionic, Corinthian, or Composite columns, the circumference at either end will be divided into six equal parts, by taking half the diameter at that end, and applying it round the said circumference; then each of these divisions being divided into four, the whole circumference will be divided into twenty-four: in order to have the proportion of a flute to a fillet as 1 to 3, divide any one of the last divisions into four equal parts, and one of these parts will be the breadth of a fillet, which being set off from the same side of each division, the whole column will be divided into flutes and fillets; then by turning the rule round to each mark, or division, you may with a piece of sharp steel draw on the shaft of the column the flutes and fillets, to the greatest exactness, by keeping it close to the side of the rule.

This method is by far the most ready, as well as the most correct of any that I have yet seen; this machine is shown complete on the plate, and I hope a careful inspection will render it sufficiently plain: there are other methods of drawing the flutes on the shaft of a column, as by drawing two parallel lines through the centre at each end of the column, and dividing the circumferences at the ends into the number of flutes and fillets, then bending a thin rule from the respective divisions at each end; it is necessary to be careful that the edge of the rule by which you draw, touch the curved surface of the column only: but this method, however simple, is very liable to error. Other methods, used by some workmen for setting off the flutes and fillets round the shaft of a column are as follow:

ARCHITECTURE.—Those of our readers who have received No. 1 of volume *seven*, will have perceived that we have commenced *republishing* a treatise on Architecture; in this number will be found a continuation of the work, with a specimen on the first page of the engravings which are to accompany it—by way of rendering the subject of architecture more familiar to the younger part of our readers. There will be about forty engravings, illustrating not only the different orders, but showing also the method of *constructing* them. By this work the reader will get an idea of the different orders, which will undoubtedly create a desire to look further into the subject; which desire we hope to be able to gratify, after this treatise shall have been completed, by republishing *copious extracts* from the article "ARCHITECTURE AND BUILDING," from the ENCYCLOPEDIA BRITANNICA, seventh edition, by WILLIAM HOSKING, F. S. A., Architect, with a few of the engravings.

These two works cost at the bookstores, the first *three* and the other *four* dollars—which puts them beyond the reach of many young men of talents and enterprise, but of limited means, who desire to improve themselves, and would, with proper facilities, become ornaments to our common country.

It is the intention of the editor of this Magazine, to furnish, as far as in his power, to such young men, the means of improvement at a cheap rate, and in a form which will at the same time keep up a lively interest in the numerous improvements of the day.

AVERY'S ROTARY ENGINE.—We have had occasion to speak frequently of this Engine, and always in commendation. From a knowledge of its performances, we were satisfied of its superiority over piston engines for driving *printing machines*, and therefore ordered one for a double cylinder registering machine; but in consequence of an error in constructing the first boiler, it was a long time before it was in successful operation; and when we had overcome the difficulties, and made some highly satisfactory experiments, it was, with the machine and our entire office, involved in the general ruin of the 16th December, and thus for a time ended our *experiments* with the Rotary Engine. That conflagration, however, did not destroy the principle nor the success of the Rotary. Experiments more satisfactory than at any previous period, in this city, have been recently made, and we have no hesitation in saying that we shall be able to give, in a few weeks, a statement of facts which will satisfy many who are now unbelievers in its value.

Thus much we will now say, and are prepared to substantiate the fact, if necessary, that one of them now in operation in this city is in the daily performance of what good judges estimate at *twelve* horse power, with a daily cost for fuel of *one dollar*—only, which evaporates *forty* gallons of water per hour.

MECHANICS' INSTITUTE.—At a regular monthly meeting of the Mechanics' Institute, held at their rooms in the City Hall, on the evening of the 1st of March, the Report of the Committee on Publications, made at a previous meeting, was taken up, and unanimously adopted. The Report approved of a proposition made by the Editor of this Magazine, that it should become the organ of, and the medium of communication for the Institute with the public; and a resolution was adopted, referring the subject to the Board of Direction, with power to consummate the arrangement.

It is highly gratifying to us to be able to announce this fact, as we are sure that it will give increased interest to the work; and we hope the arrangement may prove both beneficial and satisfactory to the members of the Institute and to the proprietor of the Magazine.

A resolution was also passed authorising Mr. Wm. Norris, a member of the Institute, who is about to visit England, to convey to similar institutions in Great Britain, the good wishes of the Mechanics' Institute of N. York; to present them with copies of its Constitution, and the proceedings at its late Fair, and to request from them similar and other interesting documents which may be of interest and utility.

We hope to be able to give in our next number something of interest resulting from this arrangement with the Institute.

We publish the following extract from a letter received from a friend to the Magazine, with a hope that *many* others will do likewise, the more especially at *this time*, when we are endeavoring to supply the place of our printing office, which was destroyed by the conflagration, with a new one. If the wishes of kind friends can avail any thing, we have nothing to apprehend as to our future success with our publications.

Another object in giving this extract is, to introduce the P. S., which may be considered, as is often the case with the same portion of a lady's letter, *the best part of it*. It refers to a subject of immense importance, and we should be highly gratified to receive from others communications in relation to the same subject, especially if they are prefaced with the same substantial evidence of its authenticity, a *five dollar note*.

"I herein send you a five dollar note, which you will please to place to my credit, for the Magazine, and if you have a copy of No. 1, vol. vi. left from the ravages of the late fire, you wtll oblige me much by sending one. * * * * Wishing you a greatly increased circulation of this Magazine,—and that the powers which you have heretofore industriously used in extending scientific and mechanical knowledge, may soon restore your losses by the late calamity, I remain, sir, respectfully, yours,

"J. H. M'C.

"Pittsburgh, Pa., 14th Jan., 1836."

P. S. I am engaged in the business of builder, in this city, and have felt much interest in the accounts from New-York, of facts and circumstances brought out by the late conflagration, amongst others, fire proofs or safes are important.

It appears that some people have imagined that iron, when in the shape of a chest, or box, was not liable to be heated or fused by fire.

But the statement of a gentleman respecting a fire proof constructed of stone, has excited in my mind some doubts. It was a closet, constructed of stone walls two feet thick, which remained perfectly sound after the fire, but upon opening, it was found that its contents were entirely consumed. Now, the following account of the manner of constructing fire proofs in this city, it seems to me, would afford an explanation of the case above mentioned. A closet is built of bricks, walls from 9 to 18 inches thick, and on the entrance two doors are placed, with a space between them of from 9 to 18 inches. Into this space, a current of air is introduced, commonly from the outside of the building—near the ground, of course, and then conducted out above the top of the closet. This air is intended to keep the space between the doors cool, in the case of fire near the outside one. But this, it is evident, is only providing against one condition of danger, viz: fire inside of the house, while it *exposes* the closet to another, viz. fire *outside* of the house. Suppose a quantity of burning ruins, or other material, on fire near to the opening provided for cold air; it is obvious that a stream of *hot* air, or perhaps flame, would be drawn into the very chamber provided for cold air, and thus endanger the contents of the safe. Might not the contents of the safe in New-York above referred to, have been destroyed in this manner? Now, the plan which I propose for building fire proofs, is simply this: To build walls of brick 13 or 18 inches thick—put on the entrance doors, with a space of about one foot between; thus excluding all communication from within and without, making the inside door as close a fit as possible, so as to exclude the air, and if the outside one should become heated, the air between them, when rarified, would force out between the edges of the door and its frame. In my opinion, it would rarely happen that the burning of a house would melt the outside door, if made of iron say 3-8 thick: and I think it would be quite as rare that the walls of such a safe would ever be heated to such a degree as to consume wood or paper inside.

This subject is worthy of attention, and perhaps were you to call attention to it, some of the scientific and practical correspondents of the Magazine would furnish something of incalculable value to inhabitants of cities. J. H. M'C.

From the London Mechanics' Magazine.

ON WATER AS A SUBSTITUTE FOR STEAM.

Mr. Editor,—On perusing Mr. Galt's "substitute for steam power," No. 629, p. 403, and the subsequent remarks of "Hydraulicus," No. 631, p. 460, I was reminded of an attempt made about two years ago by myself and an engineer, who has since constructed for me a steam-carriage, to employ water on the principle of Bramah's hydrostatic press, as a substitute for steam. My object was to propel a slow heavy carriage as a substitute for the carriers' waggons in present use. The experiment may be said to have failed: the utmost velocity that the enperiment promised, supposing all intermediate difficulties could have been successfully combated, would not have exceeded a quarter of a mile an hour—too slow for my purpose. The same ideas, or some modification of them, seem to have presented themselves to Mr. Galt and to Hydraulicus. Should my experiment, and its result, possess enough of interest to entitle them to a place in the Mechanics' Magazine, you will oblige me by inserting this paper, whilst attention is directed to the subject.

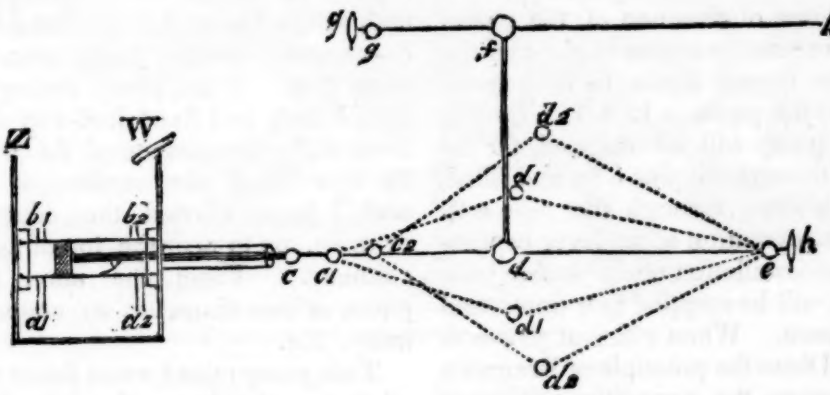
Having, in the first place, prepared a suitably strong iron stage, and an iron frame to carry a four-inch iron shaft, with a nine-inch throw crank at its centre, (the same I now have in my steam-carriage;) there was, in the next place, fixed upon the centre of the stage, or platform, an ordinary double-acting steam-cylinder, 12 inches diameter, 18" stroke. An ordinary sliding valve, moved by an eccentric upon the shaft, which valve I now use to govern the ingress and egress of steam, was used, on that occasion, to regulate the ingress and egress of the water. To get over the dead points, a compensating fly, just previously patented by my engineer, was added at his suggestion: this was intended to supersede the necessity of introducing a second cylinder; the motion was, however, too slow to demonstrate the utility of that fly. After the water, which was conducted from the pump into the working cylinder by a two-inch pipe, had caused the desired motion of the piston, it escaped through a two-inch eduction pipe into the tank to perform again and again the same circulation. In the tank, which was of cast-iron, and firmly fixed upon the platform or stage, was fixed a double-acting pump on the principle of De la Hire. This pump is, I presume, so well known as to need no description. In virtue of certain arrangements for working this pump, by which it was filled four times, and emptied four times, by one revolution of its lever or handle, I hoped to obtain four times the speed that could be derived from a single-acting pump: these arrangements were as is below stated. The pump was strongly fixed, horizontally, in the iron tank. The rod of its piston was restrained to perfect perpendicularity of action by a strong guide. In the parts which may be denominated the continuations of the piston-rod, was a joint just without the guide; at about 18 inches beyond this was another, a double joint, where was united, at right angles to the line of direction of the piston-rod, a rod from the lever or handle; and at about 20 inches farther was another joint near to the fulcrum, which was as firmly fixed as our ingenuity could contrive. When the machine was worked, by raising and depressing the lever or handle, the double-joint oscillated past the line of direction of the piston-rod. When the continuations of the piston-rod were in a right line, the piston was at the bottom of its stroke; when these continuations were at their extreme angle, the piston was at the top of its stroke. The piston of the pump was thus worked by an oblique leverage; such as is, I believe, regarded as the peculiar principle of the Russel printing-press. According to theory, the force moving the piston of the pump is augmentable to any extent, by shortening the oscillations of the double-joint.

By thus uniting the principle of the Russel printing-press, to be worked by a common lever—that of the double-acting pump of De la Hire, made to double its celerity of motion by an arrangement of parts of its piston-rod, and that of Bramah's hydrostatic-press, to move the piston of a common double-acting steam-cylinder, so as that as little as possible of the resultlng force should be neutralized by friction, I did hope to obtain an efficient power, which might be advantageously employed to propel heavily laden, slowly moving vehicles. But the experiment failed, inasmuch as the motion afforded was manifestly *too slow* for the purpose. When two men were working the lever, the engineer dryly remarked, "the principle throughout is good

and correct, no doubt; it only wants a steam-engine to work the pump."

If—in mechanical pursuits, *if* is often a stiffly perverse monosyllable; it sometimes sticks, like a totally insuperable obstacle, right in the way of what you would do. *If* the resulting velocity had been satisfactory, the advantages contemplated were numerous. Amongst them are the following. The stock of water, costing nothing, would have circulated somewhat like the sanguineous fluid of an animal, and lasted an indefinite time. The expenses of fuel, of repair of injuries from fire, &c. &c., to which the steam-engine is liable, would have been avoided. Almost any imaginable force, at all events any force likely to be required to propel the most heavily laden carrier's waggon up the steepest roads in England, would have been obtained from the bodily strength of two or three men, simply by shortening the oscillations of the double-joint; but the machine would have crawled more slowly. When the machine was moving upon a plain road, or down a slight descent, the oscillations might have been augmented and the speed increased. Whilst descending the steepest declivity, the velocity could have been entirely governed, either restrained or the machine quite stopped, through the incompressibility of the water, at the will of the men working the lever.

Lest my verbal description of the pump used be unintelligible, I subjoin a rude sketch of its working parts. This, however, Mr. Editor, you are, of course, quite at liberty to suppress, if you consider that it is superfluous, or that it would be a waste of space in your valuable pages.



Z is the cast-iron water tank; *y* the double-acting pump of De la Hire, strongly fixed horizontally in the tank, under water; X the guide of the piston-rod; W the end of the eduction-pipe from the working cylinder, which returns the water to the tank, to be used over again; *a* 1, *a* 2, are the induction pipes of the pump, having valves opening towards the pump, or upwards. In using this pump for a common well, these pipes may be united below the valves, so that one tube only may run down into the water; *b* 1, *b* 2, are the eduction or force pipes of the pump, having valves opening from the pump or upwards; they convey the water to the working cylinder, which is not represented. In adapting this pump to domestic uses, these pipes may be united above the valves, to form one main, which may be carried to the top of the house, if required; *c* is the first joint of the continuations of the piston rod, situated just without the guide X; *d* is the second or double joint of the continuations of the piston rod; at this point the rod *d f*, from the lever or handle, joins the piston rod at right angles; *e* is the third joint of the continuations of the piston rod, situate near the fulcrum *h*; *f* is a joint which unites the rod *d f* to the lever or handle *k*; *g* is another joint of the lever or handle, situate near its fulcrum *j*.

The fulcri *h j* being immovably fixed, when the lever or handle *k* is raised, the double joint *d* will be moved through the point *d* 1 to *d* 2, above the line of direction of the piston rod; and when the double joint shall have attained the position of *d* 2, the piston will be drawn to the end of its stroke upwards, near the pipes *a* 2, *b* 2. By this motion the pump will be filled once, through the pipe *a* 1, and emptied once through the pipe *b* 2. On depressing the handle or lever *k*, until it regain its original

position, the double joint will travel through the point *d* 1, and attain its original position at *d*. The piston will be forced to the end of its stroke downwards, near the pipes *a* 1, *b* 1; and the pump will be discharged, for the second time, through the pipe *b* 1, and synchronously filled, for the second time, through the pipe *a* 2. On continuing the depression of the handle or lever below its present position, until the double joint *d* passes through the point *d* 1 to *d* 2, below the line of direction of the piston rod, the piston will be again drawn to the upper end of its stroke, near to the pipes *a* 2, *b* 2; and the pump will be discharged for the third time, through the pipe *b* 2, and filled, for the third time, through the pipe *a* 1. On now raising the lever or handle until it shall have regained its original position, (when it will have completed just one revolution,) the double joint will pass through the point *d* 1, below the line of direction of the piston rod, to its original position at *d*; and the piston will be forced again to its original position near the pipes *a* 1, *b* 1. By this motion the pump will be emptied, for the fourth time, through the pipe *b* 1; and filled, for the fourth time, through the pipe *a* 2. Thus by one revolution of the lever or handle, or by one oscillation of the double joint *d*, the pump will be emptied four times, and filled four times. When efficient power is to be derived from the principle of Bramah's hydrostatic-press, the expeditious filling of the working cylinder is the grand desideratum—the difficulty. In short, from the relations of the two pistons concerned, (upon which relations the power of the machine depends,) it is impossible the filling of the working cylinder can be quickly enough effected, if the power to be used is to be derived solely from the principle of the hydrostatic-press. From this circumstance arose the necessity of lessening the disproportion between the two pistons; so as, in the first place, to derive only part of the efficient force required, upon the principle of the hydrostatic-press; and, in the next place, make up in some degree by advantageous leverage, that could be worked quickly and powerfully, to impress the first impetus upon the water. This leverage seemed attainable most easily through the principle of oblique action used in the Russel printing-press; and if obstacles should arise, such as ascending a steep hill, greater than the primary force at command could overcome by full strokes of the piston, the resultant force might easily be augmented, by the employment of only the same primary force, by using half-strokes of the pump, by keeping the oscillations of the double joint between the points *d* 1 above and *d* 1 below the line of direction of the piston rod.

Although the combination of levers for working the pump was, I think, unexceptionable, and might be advantageously used on some occasions, still the experiment, on the whole, failed.

If there be any originality in the combination, I have no desire to reap any advantage from it by way of patent. I should, indeed, more desire to hinder any one else from so doing; first, by offering herein the unlimited use of it to any one who may chance to see its utility and applicability; and, secondly, by stating, that I have lately constructed another pump upon nearly the same plan. This pump, during the summer, I have had fixed holf-way down in a deep well—the surface of the water being 36 feet below the surface of the earth, and I have carried the eduction pipe, or main, up to near the top of an adjoining chimney. From the main go lateral pipes, of less diameter, to coppers, sinks, dairy, &c.

This pump raised water faster than either of the cocks upon the lateral branches would deliver it, whilst subject to only the pressure of the atmosphere. The water then accumulated in the main, more or less, according to the strength and activity of the pumper. The weight of the column of water in the main, which kept augmenting only until it reached a point now to be noticed, was adding continually its pressure to the weight of atmosphere, by which the delivery was accelerated by the cocks upon the lateral branch, turned on till it attained a point of equilibrium—a point at whieh the cock upon the lateral branch, although of less diameter than the main, or the barrel of the pump, delivered water just as fast as the pump could raise it.

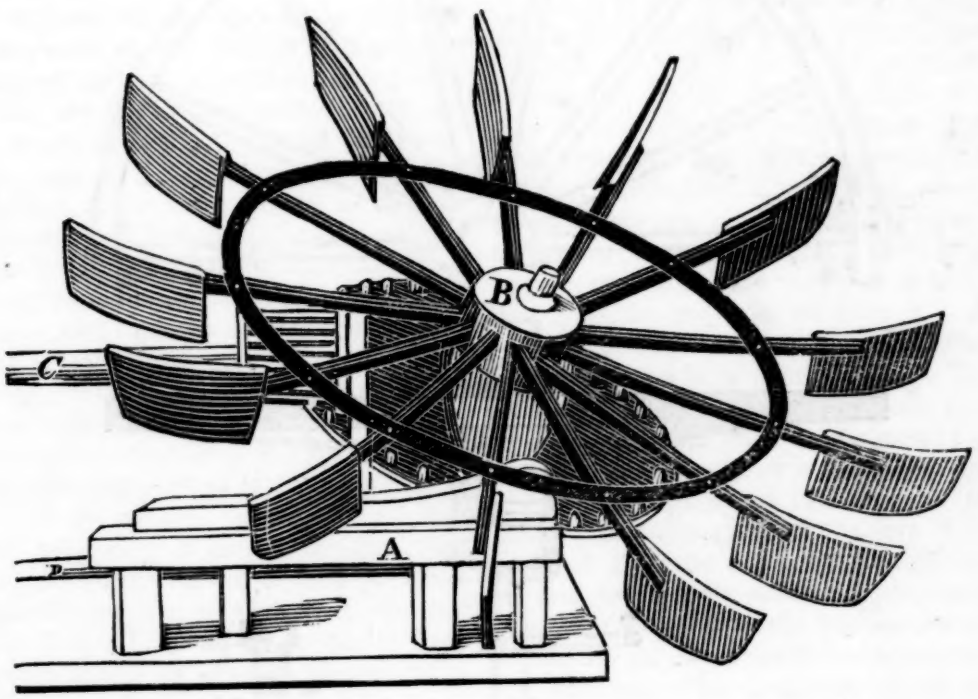
When all the cocks upon the lateral branches were turned off,—the discharge up at the chimney, at the top of the main, was so profuse and forcible, that it led me to expect that, if a pump of this description were fixed in every house, and a flexible or

hose pipe fitted by an union joint to the end of the main, or at some more convenient part, it might, in the case of fire in the establishment, be of considerable use as a fixed fire-engine, as well as serve the purposes of an ordinary pump for domestic uses.

KAPPA.

Sept. 21, 1835.

INCLINED WATER-WHEEL.



We were invited a few days since to examine the model of a water-wheel upon a plan to us entirely new. It was called the "*inclined water-wheel*," and is in some measure represented by the above cut.

The object of this wheel is, as we were informed by the Patentee, to be used as a *tide* wheel, or in rapid streams, without the expense of constructing a dam; and one of its great advantages is believed to consist in its peculiar construction, by which it may be used without the expense of erecting a pier in the water to sustain the outer end of the shaft, which is necessary in using the ordinary wheel.

The shaft of this wheel stands at an angle of 15 to 30 degrees, the upper end leaning towards the water, causing the paddles, which are made fast to projecting arms, of ten to fifteen feet in length, to dip in the water, and the wheel of course turns by the power, and with the velocity of the current.

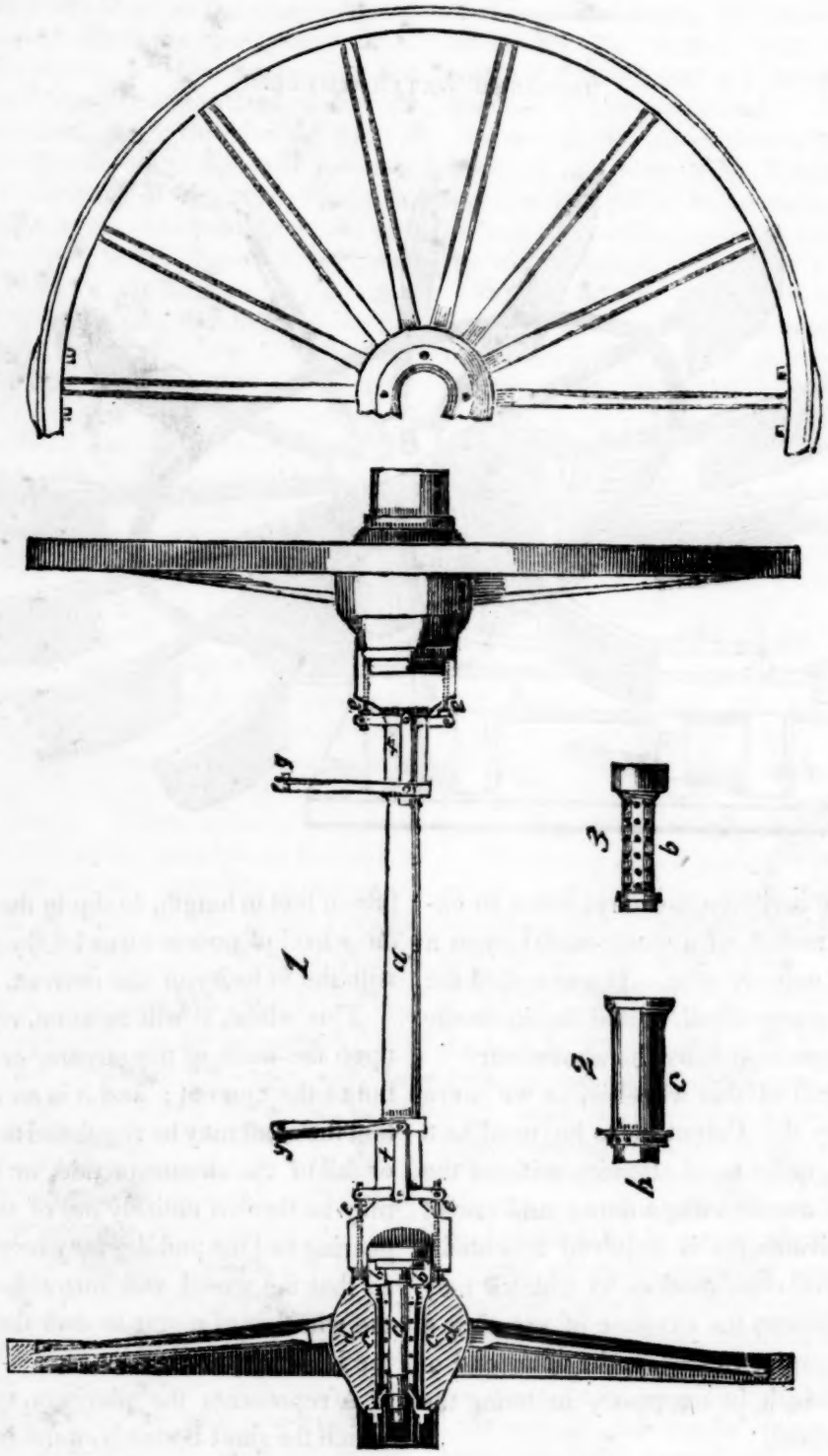
This wheel, it will be seen, rests entirely upon the bank of the stream, or wharf built out to the current; and it is so constructed that the shaft may be regulated to suit the rise or fall of the stream or tide, or the paddles may be thrown entirely out of water. The gearing and the paddles may be so constructed that the wheel will turn either way, and the wheel is of a size to suit the power and the labor required.

A represents the platform, or frame, on which the shaft B stands, and it may be made permanent, or moveable, as may be desired.

This wheel was invented by Cotton Foss, and Justin Ware, of Madison, Ohio, and Andrew Luke, 352 Broadway, New-York.

HYNE'S PATENT CARRIAGE WHEELS, AXLES, AND BOXES.

Fig. 4.



From the London Mechanics' Magazine.

Mr. Hyne's Patent Improvements in Carriage-Wheels, Axletrees, and Boxes.

The improvements comprehended under this patent, divide themselves into two distinct branches. The *first* consists of a method of constructing the wheels and axletrees of carriages, or rather in certain convenient appendages thereto, by which the wheels can be instantly locked or unlocked without alighting for the purpose, as in the case of the ordinary drag-chain and slipper, and so concealed, that externally they are hardly perceptible; the *second* in so constructing the boxes and securing the ends of the axletrees permanently therein, that there shall be an abundant, never-failing, and *equally diffused* supply of oil to the rubbing surface, without its being necessary, as usual, to take off the wheels every now and then, to renew the supply of oil, or to remedy the effects of that unequal oiling, which is the besetting sin of all former contrivances of this sort.

The object aimed at by the patantee will be at once recognised as of first-rate importance; nor do we run much risk, we apprehend, in giving it as our opinion, that he has gone further towards their complete accomplishment than any inventor who has preceded him. It is not often that so happy a combination of science, sound judgment, and ingenuity, come before us, as is displayed in the various contrivances which we shall now proceed to describe in detail.

The figures on our front page represent, 1, a back elevation of a pair of wheels, axle, and boxes, constructed according to Mr. Hyne's patent, with one of the wheels and boxes shown in section; 2, a side-view of a box, with its external cover on; 3, a similar view of a box, with the external cover off; and, 4, part side-view of a wheel in its complete state.

1. *Of the Locking and Unlocking.*

The axle *a* (fig. 1,) differs essentially from all other axles, in having shoulders or enlargements, of the peculiar form represented in the engraving, at those parts where it comes into proximity with the inner ends of the naves—the axle and its shoulders being forged or welded together all in one piece. Two holes are drilled in each shoulder, through its entire length, for the reception of the locking-bolts *e*; and in the back of each nave there are four holes or recipients made at the four cardinal points of a circle, corresponding with that described on the rotation of the axle, by the holes in the shoulders thereof; so that when the wheels are screwed on and adjusted as close as possible to the shoulders, the bolts, on being let loose, must shoot with unerring precision into the first two holes in the nave which they come opposite to. The command of these bolts may be effected, either by a jointed lever, as shown at *g g* in our engravings; one end of the lever being placed within reach of the person riding in the carriage, or of the attendants; or by chains carried to any part of the vehicle which may be thought most expedient, and there secured by hooks, or other holdfasts. The size of the bolts must, of course, depend on the size and weight of the carriage; and also, in some degree, on the uses to which it is to be applied; as, for instance, whether it is to be worked at high or low velocities, whether on a level or a hilly country, &c. The inventor thinks that bolts of from half an inch to one and a half inch in diameter, would be found abundantly strong for the lightest private carriage up to the heaviest stage-coach; and though he considers *two* bolts inserted into the nave, in the manner described, to be quite sufficient to counteract the leverage force of the peripheries of the wheel, he has been careful to point out that the principle of his invention admits of *four* bolts being made use of, equally well with *two*.

As in every case of locking the wheels, a great increase of pressure must necessarily take place at one of the four points on the tires which correspond with the position of the bolts and recipients, Mr. Hynes, to protect the tires at these particular points, defends them with plates of soft steel, or case-hardened iron, about eight inches in length, indented or dovetailed into the tires, screwed thereto, and projecting but little beyond the general surface.

The contrivances which Mr. Hynes makes use of to adjust the wheels to the arms of the axletree, are those commonly known by the name of Collinges; namely, collets, nuts (with right and left-handed screws), linch pins, outer caps, &c. We gather from his specification, that he thinks this the most perfect mode of adjustment which has been yet invented; and perhaps he is right, though on this point it is certain all the carriage-making world are not agreed.

2. *Of the Axletree and Boxes.*

Every reflecting person at all acquainted

with carriage economy, is aware that upon *friction* depends draft, and that, accordingly, in proportion as friction is reduced, so draft is diminished, and *vice versa*. The great desideratum, therefore, is a constant and abundant supply of oil to the arms, and every part of them—oil being the best of all known lubricating substances. The question here consequently presents itself—Have the grooves, or things called "reservoirs," which are now found in all the most improved boxes, ever yielded such a supply? It would not, we imagine, be difficult to demonstrate, that the very best boxes hitherto made never did or could accomplish any thing of the kind. There is an eternal law of nature, that of gravitation, which forbids it. In all of them—take Collinge's for example—there is a small space or groove called a reservoir. This groove is cast in the metal, is situated near its back end, and may contain, when fully served with oil, which can only be to about a fourth of its *circumference*, a table spoonful of oil. Well, at the other extreme *end* of the arm, that is to say, in what is called the "cap," in front of the wheel, there is a similar reservoir, containing, perhaps, another table spoonful of oil. However, *between* this last-mentioned reservoir, and the arm which it is intended to feed with oil, there are two nuts and a coned collet, all closely fitted and screwed on to the axle. Now, be it remembered, that the arm and boxes are presumed to be "*air-tight*," and that the position of the arm is nearly horizontal; and, moreover, that these reservoirs are placed absolutely *under* the lowest point or level of the thing which they are meant to lubricate! We are told, indeed, that the reservoirs *turning* with the wheel, "wash the oil *up*;" and further, that this constant action of the wheels has the effect of producing a "vermicular motion" about the arm, which, in its turn, again causes a "pumping" of the oil all along the *air-tight* arm, from one extreme reservoir to the other. But does not this amount to a mere reciprocation of impossibilities? The theory might, perhaps, have some little feasibility about it, were the boxes and reservoirs *fixtures*, and the arm a revolving cylinder within them; but as the case happens to be reversed, the arm being a *fixture*, and the boxes *revolving* bodies, no such vermicular motion can occur under any circumstances of time or place. As the box *revolves*, so must the *oil* within it. Beyond the boundaries of its narrow sphere gravitation will not permit it to stir; water could as easily return to its source, as oil mount *up* in the manner supposed, especially when we know that the motion of the wheel near its *axis* is comparatively a *slow* one, even when the *periphery* is in a state of the utmost velocity.

We have, for the sake of impartial comparison, here adverted to the very best boxes extant only, and not touched at all on those which are cast with *serpentine* grooves, which are, in fact, unworthy of comment. They carry in them the elements of their own destruction, for no tools can be made to "clean them out," even if they could be made otherwise effective.

Let us now proceed to describe the improved box of Mr. Hynes. This consists of two wrought-iron concentric cylinders or tubes (figs. 2 and 3), the one about a third less than the other, leaving a space between which serves as a reservoir for the oil. These tubes screw into and upon each other at their extremities, in such a manner that the space between them is perfectly closed at both ends, and the better to prevent any lateral escape of oil, a cap (*h*) is screwed on to both at the outside. But that the oil may pass freely and uniformly to the axle-arm, where it is wanted, the inner cylinder is perforated with holes at equal distances. In every other box hitherto in use, the oil, as we have before pointed out, is supplied to two or three parts only of the axle-arm, and never reaches, except, perhaps, in very remote portions, the other parts; but as this double box revolves with the wheels, it distributes through the holes in the inner cylinder an equal supply of oil to every part of the axle. As often as a new supply of oil is wanted, it is introduced without taking off the wheels (as the ordinary practice is), or even unscrewing and uncapping the cylinders, by simply withdrawing a small plug in the outer box (not shown in the engravings), which covers a small orifice leading to the intermediate space appropriated to the oil.

Both improvements, it will be observed, are of universal application—to all public as well as all private vehicles—to railway as well as to common road carriages. The safety-apparatus could hardly, we fear, be depended on at such high velocities, as are becoming common on railways; but to gentlemen's carriages employed for travelling on common roads, at ordinary rates of speed, it must prove an invaluable appendage.

Applications of Chemistry to the Useful Arts, being the substance of a Course of Lectures delivered in Columbia College, New-York, by James Renwick, Professor of Natural Experimental Philosophy and Chemistry.

II.

ALKALIS OF COMMERCE.

Continued from our last.

The demand for soda in the arts is such, that it cannot be supplied by the ashes of marine plants: it has therefore been obtained from common salt, and the manufacture from this material is now successfully conducted in France.

The first part of the process is the same as that described for the manufacture of muriatic acid. The residuum in the cylinders, after the whole of the acid has been evolved, is sulphate of soda.

To decompose sulphate of soda, various modes have been proposed, but that which has superceded all the others is the invention of a French manufacturer of the name of Leblanc.

PROCESS OF LEBLANC FOR THE MANUFACTURE OF ARTIFICIAL SODA.

AUTHORITY,—DUMAS. Chimie appliquee aux arts.

History.—Sulphate of soda may be converted into sulphuret of sodium by calcination with charcoal. The sulphuret of sodium is soluble in water, and may be converted into bi-carbonate of soda by passing a current of carbonic acid through the solution; for under the influence of that acid, the sodium will decompose the water, and unite with its oxygen. A gentle calcination will cause the bi-carbonate to part with its excess of acid. There are, however, but few cases where this plan could be advantageously employed. Before the French revolution, sulphate of soda was heated in a furnace with charcoal and iron. The product was a fused mixture of caustic soda and sulphuret of iron. But this method is no longer practised.

Rationale.—In Leblanc's process, 1000 pts. of dry sulphate of soda are mixed with 1000 pts. of chalk (*carbonate of lime*), and 550 of charcoal in powder. The proportions are nearly the same as 2 equivalents of sulphate of soda, 3 of carbonate of lime, and 18 of carbon. When these are heated together, the sulphate of soda and two equivalents of the carbonate of lime mutually decompose each other, and become carbonate of soda and sulphate of lime; the latter is decomposed by the carbon, and becomes sulphuret of calcium. This sulphuret being soluble in cold water, and being then reconverted into sulphate, which in such case would act upon the carbonate of soda to produce a double decomposition, the third equivalent of lime is necessary, for this forms with the sulphuret of calcium a compound which is insoluble in cold water.

Manufacture.—The three substances above mentioned, being mixed in the proper proportion, are placed on the hearth of a reverberatory furnace, by means of a door left in the side wall. The mixture speedily begins to fuse and run together in lumps. To prevent the last action, it is well stirred with a rake. So soon as the whole is fused, innumerable bubbles of carbonic oxide escape, and burn as soon as they come in contact with air. The water which exists in the materials is next decomposed, and uniting with sulphur and carbon, yields carburetted and sulphuretted hydrogen, which also burn. So long as these gases are forming, the mixture must be continually stirred; when their escape ceases, the process is nearly completed. The mixture is tested by thrusting a bar of iron into it, and examining the crust which adheres; when this exhibits a homogeneous character, the operation is finished. The fused mass is then drawn from the furnace, and permitted to cool upon the ground-floor of the factory.

If the charge be 800 lbs. of sulphate of soda, and the proper proportions of the other materials, the action lasts about two hours; and about five charges may be acted upon in 24 hours.

The solid matter thus obtained is composed of about equal parts of carbonate of soda, and the compound of sulphuret of calcium and lime. Their joint weight is about 60 per cent. of that of the materials employed; the remaining 40 per cent. has gone off in the form of gas.

The carbonate of soda may be separated by lixiviation and evaporation to dryness. The latter process is performed in an apparatus composed of four boilers placed over the same flue. That which is farthest from the fire is merely used for heating the liquor to the boiling point; in the two next it is concentrated, and in that which is over the fire, the evaporation to dryness is completed.

The dry mass obtained from the furnace in which the decomposition is effected, generally contains some sulphuret of sodium; by exposure to the air this is converted in hypo-sulfite of soda, which is soluble in water, and exists in the product obtained by evaporation to dryness as an impurity. Pure and crystalized carbonate of soda may be obtained by permitting the ley to crystalize in cold weather. The mother waters of this process are evaporated to dryness, and give a soda of inferior quality.

Such is the demand for the artificial soda in France, that it has not been found possible to supply it, and at the same time save all the muriatic acid which is set free in the formation of the sulphate of soda. In many of the manufactories the common salt and sulphuric acid are heated in a reverberatory furnace, and the waste heat is used to heat a second furnace, in which the sulphate is decomposed. Hence the mixed gas and heated air is made to pass into large chambers filled with blocks of quick lime. This serves to condense a part of the acid. From this chamber the smoke is conveyed, by a sloping channel, also lined with quick lime, to a chimney.

When a sufficient quantity of water can be commanded, the fumes are conveyed from the furnaces to a sloping channel, along which a current of water flows, or enter a lofty tower filled with pebbles, over which a small stream of water trickles.

If this manufacture should ever be introduced into this country, the muriatic acid will probably be at least as important a product as the soda; the method of cylinders and condensing vessels of glass will therefore be the most advantageous.

It cannot be doubted that the time is not far distant when these substances will be manufactured to advantage in the United States, probably in the vicinity of our salt springs.

It may also be mentioned that the *salsola* is a native of our maritime coast, and that our extensive salt marshes might probably be applied with profit to its culture.

3. AMMONIA—SAL AMMONIAC.

History.—The ancients were acquainted with a salt brought by way of Egypt from the Temple of Jupiter Ammon, in Lybia. As this was found in the stables of that temple, it was probably the triple phosphate of soda and ammonia. A substance of different origin, (the muriate of ammonia,) being subsequently brought from Egypt, the name of the former (sal-ammoniac,) was applied to it, for in the infancy of chemical science the two substances were confounded. The manufacture of sal-ammoniac was afterwards introduced into Europe—putrescent animal substances being employed for the purpose of furnishing the volatile alkali. This manufacture received its greatest extension on the establishment of the *abattoir des chevaux*, at Montfaucon, near Paris. Still more recently, large quantities of ammoniacal liquor have been obtained at the works where *gas* is prepared from coal for the purpose of illumination.

Process used in Egypt for the manufacture of Sal-Ammoniac, (Muriate of Ammonia.)

AUTHORITY.—Description d'el Egypte.

Almost the only fuel employed in Lower Egypt is obtained by drying the dung of camels and other animals. In the decomposition of this, by the heat of the fire, muriate of ammonia is formed, which being volatile passes into the chimnies, where it is condensed along with carbonaceous matters in the form of soot.

The soot being collected, is introduced into large globular vessels of thin glass, until they are more than half full. A number of these balloons are then placed in a species of long stove, the opening by which the soot was introduced being placed uppermost. Heat being applied to the bottom of these vessels, the opening is closed as soon as the air contained in them has reached its full expansion. If closed before, the vessel would be broken; and it is necessary, towards the close of the process, to keep this opening free, by an iron rod.

The muriate of ammonia which is sublimed from the soot, condenses on the upper part of the interior surface of the globular vessel, in the form of slender acicular crystals, which, by their aggregation, form a tough, tenacious cake. In this form, it becomes an article of trade. The cakes weigh from 3 to 6 pounds, and are slightly blackened by the carbonaceous matter.

European Process.—In the cities of Europe, the collection of rags forms an object of industry. Those of linen are employed in the manufacture of paper; some of the woolen rags contain colors of sufficient va-

lue to make it worth while to extract them; but the greater part are of no other use but to be decomposed by heat, for the sake of the ammonia they are capable of yielding. This decomposition is effected in iron cylinders at a low red heat. The volatile matter which is evolved, is condensed in receivers of glass or earthenware. By condensation about half the weight of the woolen is obtained in a liquid form, charged with an impure carbonate of ammonia, along with an empyrcumatic oil, which is of no value. To convert the carbonate of ammonia into muriate, the mother waters left by the crystalization of common salt, which contain muriates of the alkaline earths, (or more properly, chlorides of their bases,) are employed. These are concentrated by boiling to a density of 1.367*, and are then mixed with the ammoniacal liquor in the proportion of 1 to 2. By the double decomposition which ensues, a quantity of muriate of ammonia is formed, which remains in solution in the liquid, while the carbonates of the earths are precipitated in the solid form. The latter are separated by decanting and filtration, and the liquid is evaporated to dryness. In this state, or merely crystalized, it might be an article of trade, but as the form of the Egyptian sal-ammoniac is required by the consumers, it is sublimed in glass balloons, exactly as in the Egyptian process, and it has a superiority over what is obtained from that country, in being of a purer white.

Bones, horn, parings of hides, and almost all other refuse animal matter, whose putrefaction has commenced, when distilled at a low red heat, yield ammonia and its carbonate. The horns of deer, in particular, yield it in a tolerable degree of purity, and were employed in the fabrication of the liquid known as spirits of hartshorn, a name that is still occasionally employed to designate the pure solution of ammonia which is obtained from the decomposition of its muriate.

A sulphate of ammonia has been manufactured by filtering the liquid obtained by the distillation of animal substances through powdered sulphate of lime (gypsum). The sulphate of ammonia is obtained in the solid form by cyrstalization. This sulphate has also been converted into muriate, by mixing it with common salt and subliming. This method has been claimed, by Dr. Ure, for an Englishman of the name of Minish, but it was invented many years since, in Germany, by Wensel.

For the manufacture of the liquid ammonia, the sulphate answers as well as the muriate.

40° of Beaume.

Instead of iron cylinders, tight kilns of brick have been used for the decomposition of the animal matters. Muriatic acid gas may be generated in a similar kiln, by the action of sulphuric acid on common salt. If the two gases be made to meet in a receiver lined with lead, the bottom of which is covered with a few inches of water, the sides and top will be covered with crystals of sal-ammoniac.

The muriate or sulphate of ammonia may be decomposed by quicklime, and gaseous ammonia evolved; or, by the addition of water, the solution of that gas in the liquid may be obtained, and condensed in proper receivers. This process is rather an object of elementary chemistry, than of its application to the arts.

From the London Repertory of Patent Inventions.

FIRST ANNUAL REPORT, REGARDING NEW INVENTIONS AND IMPROVEMENTS IN THE USEFUL ARTS THROUGHOUT EUROPE: ORDERED BY THE SOCIETY OF ARTS FOR SCOTLAND: BEING A REPORT ON THE RECENT IMPROVEMENTS OF THE CARPET MANUFACTURE. BY MR. EDWARD SANG, TEACHER OF MATHEMATICS, AND LECTURER ON NATURAL PHILOSOPHY, EDINBURGH. M. S. A.—The progress of almost any of the arts may be safely taken as an index of civilization. The arts, indeed, are so intimately interwoven, that one of them can scarcely flourish without giving rise to and receiving support from others. Our farms could not be cultivated, nor their produce brought to market, unless many preparatory labors had been gone through, nor could these labors have been attempted, until the improvement of agriculture itself had procured some leisure of the human race. In like manner, all the arts mutually receive support from and assist each other; so that, in attempting to view the present state of society, we would need to consider the arts, not in detached pieces, but as one vast and compact whole. But if our object be to compare one age with another, and to ascertain the rate of civilization, as it were, we may easily select departments which, receiving active assistance from many others, may indicate, with sufficient nearness, the general state of the whole. There are arts, such as the manufacture of glass, which have, as yet, depended so slightly upon others, as to afford no criterion of the general progress. Our ignorance of high temperatures, and the in-

corrodible nature of glass itself*, have prevented this important manufacture from receiving that powerful assistance which chemistry might have been expected to have yielded to it: the method of forming glass vessels has thus remained almost unchanged, and still entirely depends on the strength and dexterity of the workman.

Not so with the manufacture of carpets: this, like the other branches of weaving, has received improvements at every hand, and has lately made important advances. The very fact of the existence of such a manufacture speaks volumes as to the increase of our domestic comforts. But a few generations back, the royalty of England was contented with that fare which we now confine to our stables, and lands were granted for the servitude of providing *clean straw* for the royal chambers. Well-scoured deals, and good Kidderminsters, have now displaced that vehicle of infection, and that, not merely in the houses of the wealthy, but even in the dwellings of the industrious artizan. To some, the introduction of such luxuries may appear to savor of effeminacy; those who admire nations only when formidable in war, who glory in bloodshed and devastation, may fear that when each peasant treads upon a well-made carpet, when the cot boasts of luxuries unknown two centuries ago, even in the palace, nations will lift but feeble hands in encroachments upon each other. But he is much mistaken who regards such comforts as marks of effeminacy. Were they the results of Roman spoliation,—were our own furniture, our china, and our carpets torn from the industrious inhabitants of conquered provinces,—had we our silks for tribute and our cottons for booty, then, indeed, would we be effeminate and vicious.

But those comforts which we so richly enjoy are the results of industrious and upright toil. Every luxury that surrounds us is the fruit of skill and energy: the procuring of it has exercised our patience and improved our strength, while the enjoyment of it restrains us from wanton aggressions on our neighbors, and nerves us in our own defence. The spread of comforts among every rank, guards us against tumult on the one hand and oppression on the other; and every improvement on our manufactures, every cheapening of our commodities, is a step forward in the path of happiness and security.

It is not merely by its existence that the carpet manufacture bears testimony to the advanced state of society; the elegance of its processes, and the beauty of its products, speak a language no less distinct.

In the superficial texture of the common carpet, nothing appears to distinguish it from an ordinary web; and a first observer is at a loss to imagine by what means its variety of colors can be produced. On examining the figure more narrowly, it appears that the designer has labored under considerable difficulties: for in many places where purity of color would have been advantageous, a mixed color only is to be found, whilst scarcely any gradual shading of the tints depending on the nature of the figure, is to be seen. A still closer examination explains at once the source of these imperfections. The carpet is found to consist of two contiguous webs, intermingled with each other in such a manner as to produce the pattern: each of these webs, if woven singly, would have a striped appearance, being party-colored in the woof. One set of colored stripes is thus imposed upon another: and in designing the colors of the pattern, no selection beyond what is afforded by the judicious arrangement of these stripes can be made. The number of full colors is thus very limited: these can only be obtained where woof traverses warp of the same color. To bring up, then, a part of the figure full red, red warp of the whole breadth must be traversed by red woof the whole length of the spot; these colors can be immediately concealed by sending the threads to the other web, but were they to remain long there, both webs would become monotonous. It is therefore extremely difficult to avoid a strong tendency to striping in the colors, and, except on the principal part of the figure, the colors can hardly be well managed, the secondary embellishments being almost matter of chance. Yet, in the face of all these difficulties, patterns of great beauty are daily formed on the carpet loom.

The invention of the *triple carpet* by Mr. Morton, of Kilmarnock, has almost removed these difficulties. This carpet is composed of three webs, which interchange their threads in order to produce the pattern.

* The incorrodible nature of glass, we believe, has been greatly exaggerated. See Repertory, new series, vol. i. p. 182, in the number for March, 1834, and vol. ii. p. 299, in the number for November of the same year.—A. T.

The primary object in the introduction of the third web, appears to have been the obtaining of greater variety and brilliancy of coloring; but another curious effect has followed, that the two sides of the carpet are necessarily counterparts to each other. To a certain extent the figure of the under must depend on that of the upper side, since threads may be needed from the under web to produce what is wanted in the chief pattern, but there still remains the choice of an interchange of threads between the two inferior webs. It is obvious that the tendency to striping must be much less on this than on the common carpet, and that the designer having a far greater choice of colors, may produce effects that could not before have been attempted. It appears to me that, after the principal figure has been determined on, the skill of the designer is most severely exercised on the wrong side of the carpet. His choice of materials is indeed as great as with the common carpet, but then he is hampered by the restriction in figure, and can only be entirely at ease opposite a flat piece on the right side. The beauty of the triple carpet is at once acknowledged: it possesses almost all the freedom in coloring of the floor-cloth or paper-hanging, while its greater thickness and comparative cheapness bring it into competition with the more expensive kinds of carpeting.

The inventor of this texture has conferred on us a very great benefit: he has furnished us with a higher embellishment for the interior of our dwellings, and presented to us another evidence of the active benevolence and social disposition of men. And it is agreeable to reflect that, in the nursing of the idea, and the carrying of it into effect, he must have felt a pleasure much more intense than is likely to be experienced by any of the multitudes who will enjoy the fruits of his abilities.

A desire for something in the interior of a dwelling analagous to the soft clothing of the external world, seems to be generally felt; for in all states of society attempts are made to remove the hardness and unseemliness of the floor. Among the poorer nations, these attempts are confined to the mere dormitories; but, as advances are made in wealth, the mat and carpet begin to appear. The softness of the turf and more than its smoothness having been attained, it was natural to imitate also its embellishments: for this purpose, several distinct kinds of carpet texture have been contrived. On one of these I have already reported an immense improvement, and proceed to describe a no less striking improvement on another.

The Brussels carpet is distinguished from the common one by having a raised pile, and by the circumstance that the figures and colors are entirely produced from the warp. The pile is raised by inserting a wire betweenthe body of the warp and the previously raised coloring threads. These threads descend and are fixed by the woof, and after a few repetitions of the process the wires are withdrawn. The Wilton carpet differs only in this, that the pile is made somewhat longer, and cut in the manner of velvet. Were the colored warp, however, raised into pile at each stroke, the web would have simply a striped appearance; and if it were raised only at intervals, the figure would be given in relief, but would still be merely striped. In order to produce a properly colored pattern, several colored yarns are arranged, so that any one of them may be raised into pile between the same two permanent warp threads. Their number is generally five, so that, by their irregular ascent to the surface, the striped appearance is almost broken up. Still, however, the web is essentially striped, and though the designer be not nearly so hampered as in the Kidderminster texture, he is still seriously incommoded in his choice. Let us suppose a board painted in minute colored stripes. After these have dried, let another coating of colored stripes be laid on, and so for five coats, each differing from the preceding: the painter may now form an idea of the difficulties encountered by the carpet designer,—let him set to work, by scraping away the different coats, to produce a pattern. But there is another annoyance; in order to produce the smallest speck of any particular color, a thread of that color must traverse the whole pattern; and that thread may displace some other which would have been advantageously brought in elsewhere. On account of the very different rates at which the colored threads are taken up, these cannot be wound on one beam, but have to be placed each on a bobbin by itself.

To remedy the inconvenience of this texture, Mr. Whytock contrived his method of

partially dyeing the yarns; but we cannot fully understand the value of the contrivance till we have glanced at another kind of carpet texture.

The Turkey carpet is the simplest in its texture of all carpets, and at the same time is almost unlimited in the choice of colors. Let us suppose ourselves seated at a common loom, and that immediately after having thrown a shot, we commence to tie on every thread of the warp a small bunch of colored worsted, varying the color according to our fancy. This completed, let two or three shots be thrown, and well driven up; and then another row of colored worsteds tied on. It is clear that in this way we could produce any pattern, and that no more of any particular color is wanted than is sufficient to produce the required effect: nay, more, the colors being put on by hand, we would not be compelled to reiterate the pattern at each stated distance. Here we have every advantage that we can wish for, excepting this important one, rapidity of formation.

Mr. Whytock's method supplies to all the advantages of the Turkey carpet, a rapidity of weaving greater than that of the Brussels fabric. His method may be described thus: If for the five colored yarns of the Brussels carpet we could substitute one yarn dyed of the repuisite color at different places, we would be able to dispense with all the apparatus for producing the pattern, could make the web with only one body, and work it as a simple velvet. The only diffieulty would then be in the dyeing of the thread.

In order to dye the thread, one yarn is wound on the surface of a large drum, of which the circumference is equal to the length required for one copy of the pattern. This drum is graduated so that the dyeing roller can be passed across the yarn at any required place. The design, extended on the ordinary ruled paper, enables the workman to discover all the places at which a particular color is to be applied: that done, he changes the color box, and so proceeds till the whole coloring is completed. The thread is then taken off the drum, and submitted to the processes for fixing and bringing up the colors. The next thread is then dyed, and so on till the whole warp is finished. The next and the most difficult process is, to place all these yarns side by side upon the beam. For this purpose they are wound upon separate bobbins, and small white spots, purposely left in the dyeing, enable the workman to arrange the colored parts properly opposite each other. They are then carefully rolled upon the beam, and the weaving proceeds rapidly, each thread being brought into the pile upon every successive wire. Mr. Whytock uses the grooved wires, and cuts the pile in the manner of the Wilton carpet.

Excepting in the necessity for the recurrence of the pattern, this has all the advantages of the Turkey carpet. The colored spots can be produced at any point, and need not run in rows as in all the others. It need hardly be added, that greatly admired patterns have already been produced by this method; and that the manufacture meets with great and deserved encouragement.

Before concluding this imperfect notice of these two improvements, I would draw attention to a subject of great importance to society in general. A strong prejudice, sanctioned by an old proverb, exists against those who turn their attention to several branches of the arts. Yet it is a fact, that almost every improver has been jack of a good many trades; nay, an acquaintance with a variety of operations is essential to the invention of new ones; and very often prodigious improvements are effected by the simple transference of a process from one art to another. May I be allowed to hint, that the triple carpet is one of those generalizations so often found in scientfic researches, and that its inventor appears to have extended his studies far beyond the subject of carpet weaving. The patent carpet, again, bears on the face of it the necessity for a knowledge of the arts both of dyeing and of weaving; for no one not intimately versed in both arts could have conceived, or, having conceived, could have carried the idea into effect. The difficulties to be encountered were by no means few, and the overcoming of each was itself an invention.

Another idea exists, that the happening upon new discoveries is a matter of chance, and some appear (I judge from their conduct) to imagine that the less they know of a subject the more likely they are to alight on something new; as a bad swordsman trusts to that very circumstance for outwit-

ting his antagonist. Once in a century, indeed, one man among ten millions may find, by chance, some valuable process; but the great mass of our current inventions are the fruits of assiduous and well-directed exertion: and the mind, even more truly than the body, must earn its food by the sweat of its brow.—[Jameson's Edinburgh New Philosophical Journal, for Oct., 1835.]

The following evidence of Dr. Lardner on the "Great Western Railway Bill," will be found to contain many items of interest and amusement to our readers.

We suspect that some of the learned Doctor's opinions on the question of railroad "inclines," will not receive a very ready assent from many of our civil engineers. However, the whole is worth a perusal; and if the parts of the examination in relation to "noxious air," do not excite a smile, our readers must be of different material from ourselves.

We shall continue it in our next.

From the London Mechanics' Magazine.

EVIDENCE OF DR. LARDNER

On the Great Western Railway Bill,

3d of August, 1835.

The Earl of RADNOR in the Chair.

DIONYSIUS LARDNER, LL. D., being examined, gave evidence as follows;

You have heard a good deal said in extenuation of the Box tunnel; what is your opinion upon that subject?—The combination of a tunnel with a slope appears to be the objection to it; and the power requisite to pull a load up a slope of 1 in 107 is greater than the power necessary to pull the same load on a level in the proportion of 30 to 9.

In round numbers, nearly 3 1-2 to 1?—Yes; it requires 9 lbs. per ton to pull a load on a level line, and it requires 30 lbs. to pull it up 1 in 107.

Applying your attention to the question of the tunnel, in what way is that difficulty aggravated beyond the mere proportion of the greater power required?—The increased power necessary for a slope must be produced by a proportionably increased consumption of fuel; that will produce a proportionably increased destruction of atmospheric air; and, of course, if the tunnel be intended to be kept as pure on the slope as it would be necessary to keep it on a level, the transverse section of the tunnel ought to be greater on a slope than on a level in the proportion of 30 to 9.

Mr. Joy.—Your attention has been called to railways in various parts of the world; do you know of any parallel to this, uniting the length of this tunnel with that inclination?—No, I am not aware of any.

Is it justifiable, except in a very extreme case, to unite those two disadvantages, such a length of tunnel with that inclination?—I think nothing but an overruling necessity could justify it.

Have you considered the different modes proposed for working that tunnel; additional locomotive power or a stationary power, either by an endless rope or a single rope?—Yes.

Have you also considered it as worked partly by the one and partly by the other?—Yes; it might be worked partly by one and partly by the other; the tunnel is not the same length as the slope; the slope is two miles and a half, and the tunnel a mile and three quarters in length; it might be worked by a rope through the tunnel.

First, as worked by locomotive engines, what would there be its great objection?—I think I have stated its great objection already; the probable difficulty attending the destruction of air by the fire; and in considering that it appears to me that it ought to be considered, not so much with regard to the positive injury that may be produced to the health or life of the passengers—I do not think there would be any—but with regard to the unpleasantness and inconvenience arising from the existence of a quantity of noxious vapor through which they would be carried.

That is an objection more or less applicable to tunnels upon a level?—Less applicable to them, because there would be less power requisite.

Would the atmosphere of the tunnel be injuriously affected and impregnated with the gases produced by the combustion?—Not injuriously, but inconveniently, I think.

You have stated that there would be so much greater power required, and that requiring a greater proportionate quantity of combustion, that the ill effects would be produced in that proportion. What would

be the proportion of increase in the consumption of fuel?—As 30 to 9.

In the same proportion as the increase of power?—Yes.

Mr. Joy.—Would there be as much air consumed in that tunnel as in a tunnel on a level of five miles and four-fifths long?—Yes, nearly. The length of the tunnel would be in the proportion of 30 to 9; there would be as much air consumed in this tunnel as there would be in a level tunnel longer in the proportion of 30 to 9.

Do you think any method of ventilation could be attainable that would render it otherwise than almost intolerable?—I scarcely think that the common mode by shafts would do it.

I have asked you whether it was actually practicable; is it not a feature devoutly to be avoided?—Yes.

To be avoided at almost all hazards?—Yes.

Would it be an eligible thing, such a tunnel in the course of a line, or almost intolerable?—I think it could be justified only by overruling necessity.

Mr. Joy.—Is this grievance much the same, or very materially aggravated, by such a tunnel and such an inclination being in the middle of the line rather than at the extremity?—Yes, it is more objectionable than at the extremity.

Why?—Because of the unpleasantness, and the interruption to the transit of the trains when the passengers are in them; you come to a stand-still; they must undergo a change in the moving power, and a similar change takes place at the top. At the end, if there is a tunnel, passengers hardly consider they have started until they have already passed through the tunnel; that is the case upon the Liverpool line, where there is a short tunnel at starting; no one could have travelled that line without feeling that had that tunnel occurred at Rain-hill instead of where it is, it would have been felt a much greater inconvenience, though the absolute loss of time might not be more.

Supposing Mr. Brunel shall have said, in answer to a question as to the danger of the atmosphere being rendered noxious by the passage of the engines, "I think not; there is one in existence upwards of a mile, and another on the Birmingham line;" and again, when asked, "Is the inclination so steep?" if he should have said, "It will not affect the atmosphere," is that correct or erroneous?—I think Mr. Brunel is in error there; it would affect the atmosphere.

In point of fact, is it not true that there will be an additional difficulty, as to the ventilation, from the increased power that will be requisite?—It will require more ventilation in the proportion of 30 to 9.

If it is assumed by the engineers on the other side, there will not be more ventilation required than on a level, that is an oversight, in your judgment?—Yes, that is an oversight, I suppose.

Supposing coke used instead of coal, would not the gas produced be more noxious?—No, not more noxious; it is the same gas; the combustion of coke produces carbonic acid gas, sulphurous acid, and azote. Coal would be quite inadmissible.

Mr. Joy.—Would not the gas that would escape from coke be of a more injurious nature if it existed in any quantity?—Yes; it is not only gas that escapes from the combustion of the coke, but the gas that is decomposed in the atmosphere would be more injurious.

Would not this gas, unless it found a vent in a heated state, be likely to remain?—Yes, from its specific gravity: it is half as heavy again as the atmospheric air; the carbonic acid gas.

That is the offensive gas of which you speak?—Yes, the gases are mixed together, and if they cool they are heavier than the atmosphere, and apt to remain.

The mischief must very much depend upon the quantity; is not the carbonic acid gas what the miners call choke damp, in a great degree?—Yes, it is what exists in wells and in the Grotto Del Cane.

If it is an excessive quantity, it is fatal to life?—Yes.

The degree of injury, if any there be, must depend upon the proportion?—Yes.

It may be diluted with common air, so as not to be fatal to life or health?—Yes, there is always a quantity in the air.

If the extra power is supplied by a stationary engine, the consumption of fuel would not be greater in the tunnel?—No.

Mr. Joy.—Have you made calculations of the proportions of these gases?—Yes; of the proportions of foul air to be produced.

Without troubling you to go into it in any detail, could you tell us the different

gases you think injurious; the round sum of them produced in the passage through this immediate tunnel, for a load of 100 tons in a tunnel of a mile and three quarters long, upon a slope of 1 in 107? Have you calculated the quantity of noxious gas that would probably be made?—Yes; the total quantity, taking for granted that it takes half a pound of coke per ton per mile upon a level to draw a train, which, I believe, is in practice nearly the case, the quantity of noxious gas produced in this tunnel would be something less than 4,000 lbs. weight, with a load of 100 tons.

Every time a train goes through?—Yes.

Mr. Joy.—Does any objection exist with regard to the assistant engine on the Manchester and Liverpool line; they have one there?—Yes; not in a tunnel.

I am speaking of the inclination; is there not an inclination on that line very near this?—Yes; 1 in 96.

Is there any practical inconvenience there, as you have observed the line so frequently, with reference to the additional engine?—The additional engine is not always ready to assist the train, and they have sometimes to wait.

Have they sometimes to wait from its being out of repair?—They have delays from various causes; it may not be lighted, or it may be employed upon one train, when wanted for another.

Have you known trains come to a dead stop on that inclined plane?—Yes; I have been upon it more than once when that has happened.

Have you had to wait a considerable time?—Yes, until the engine could be got.

Would the extra cost necessary for keeping this engine ready for use be another objection?—Yes; they would be always obliged to keep it ready for use, whether wanted or not.

I will call your attention to another mode mentioned, that of the endless rope; have you made a calculation of what would be the result if that system was practised?—Yes, I have.

What on the Liverpool and Manchester line, where they have a slope of 1 in 48, is the one they use?—That slope is 2,000 yards long, and the rope they use is a six inch rope, to draw loads of twenty-five tons.

At the rate of about ten miles an hour?—I do not think the rate makes any difference in the strength of the rope.

Is that the rate?—Yes.

What sort of rope would the Box tunnel require, taking the Liverpool one as the basis of your calculation?—I consider it will require a seven inch rope.

What would be the weight of a seven inch rope per yard?—I believe the weight of a seven inch rope would be six pounds and a half per yard.

What would be the total weight produced?—The total weight of that endless rope would be about 57,000 pounds.

How long?—About five miles.

Mr. Joy.—Calculating the friction of such a rope thus worked at about a twelfth of its weight, which was the proportion given by Mr. Stephenson and Mr. Locke, what pull would it require to work a train of fifty-two tons?—To propel fifty-two tons upon a slope of 1 in 107 will require for its gravity a 107th part; you are to divide the 52 by 107, and you will get the power of draught necessary to overcome the gravity of the load.

What would that be?—1,088 lbs.; then there would be the friction of the load, which is at the rate of 9 lbs. per ton, which for fifty-two tons, 468 lbs.; these two together would come to 1,556 lbs.; that is exclusive of the rope. Then the experiments of Mr. Stephenson and Mr. Locke on the friction of the rope show us, that the friction may be taken at about a twelfth part of the weight of the rope; and those experiments appear to me to be very satisfactory and conclusive; there was an average of several taken, and they have given very nearly the same result; and taking one-twelfth part of 57,000 lbs. you will get the force necessary to pull the rope, which alone is 4,752 lbs.; the load therefore would require 1,556 lbs., and the rope 4,752 lbs., making a total of 6,308 lbs.

Is not the result of this calculation, that it would require about three times the power for the rope, compared with the load?—Yes; for a load of fifty-two tons it is in the proportion of 15 to 47, very nearly.

To move that at the rate of fifteen miles an hour would require what power as expressed in horses?—Twenty-five pounds pulled at the rate of fifteen miles an hour is equal to one-horse power, and therefore 6,300 lbs. pulled at that rate, would be equal to 252 horse power.

Have you a corroboration of that result from the proposed engine on the tunnel now making on the Liverpool and Manchester railway?—The tunnel for passengers is a tunnel of a mile long, I think.

What is the power of the engine there proposed?—It is, they say, 140-horse power.

That is for passengers only?—Yes, for light loads.

What is the declivity there?—1 in 100.

Very nearly the same as here?—Yes.

Mr. Joy.—Is that consistent with the calculation you have just been giving to the Committee?—Yes, it agrees very nearly with it, as nearly as possible. I should state it would be necessary to have two engines, one to work while the other is accidentally deranged or repairing, otherwise the whole traffic upon the road will be stopped; there must be a pair of engines.

May not that be estimated at a lower tonnage in consequence of its being intended for passengers only?—Fifty tons is the amount of an ordinary load of passengers, including carriages.

Is not that about half the length of the Box tunnel?—Yes, it is about a mile long.

Is it correct to suppose that a five and a half inch rope would be sufficient for the Box tunnel, because the incline is flatter than the tunnel upon the Manchester and Liverpool Railway of 1 in 48?—No, because the length is there omitted; the length is a very material consideration; it is a much more material consideration than the degree of acclivity.

Would the calculation of the sufficiency of rope, a five and a half inch rope, be conclusive if it was applied to so much shorter a line?—No; the acclivity has nothing whatever to do with the calculation; an endless rope, which would be sufficient for a certain load on one inclination, would be sufficient for any other inclination; the weight of the rope has nothing to do with it; it balances itself.

In order to arrive at a proper conclusion, is it not necessary to take into account the greater length of the line?—Yes, and that alone.

And not the steepness?—Not when it is an endless rope; a single rope would require steepness to be taken into consideration, but not an endless rope.

At the tunnel in question, on the Liverpool and Manchester line, is not the load of the locomotive divided into five or six different portions, and drawn up at five or six different times?—Yes; it is drawn up in loads of twenty-five tons; this would not do in the middle of a line.

Is it comparatively unimportant at the end?—If the load was to be drawn up in that way in portions in the middle of the line, the line would be occupied a considerable time, and the trains of passengers would be stopped until all this business of carrying up the loads was finished; and even at the end of the line, unless the slope was exclusively devoted to goods, it would not do there.

If a load of 100 tons were to arrive at the top of such an inclination, there would be a waste of time in the arrangements necessary to divide it?—It would be divided into four, and then one would be drawn up, and then another.

Whereas 100 tons can be very easily moved upon other parts of the line?—Yes.

Do you happen to know whether the elder Mr. Stephenson asserts that an endless rope of five miles long is impracticable?—Yes, I recollect he says that.

Do you agree with him?—Yes, it is within the bounds of mechanical possibility I think, but in the common sense of the word it is impracticable; I hardly think any one would attempt it.

Have you any idea that it would be adopted?—No; the power expended upon the rope would be so preposterously great compared to the load to be drawn.

You consider it, in common parlance, impracticable?—Yes.

Now turn to the single rope. Suppose it is to be worked by a single rope, is it one of the objections necessarily involved in a single rope, that there must be a small locomotive to draw it back?—There must be some means to draw it back again, and the weight is so considerable that the power must be considerable.

Do you consider, speaking of a single rope, it would be but half the length?—Yes.

Two miles and a half; would not that require a small locomotive in consequence of its length?—It would require a considerable power, and a small locomotive would do it.

Would not there be some objection to that in consequence of its consumption of

vital air in the tunnel?—Yes; that would be an additional inconvenience.

Would it not be a constant expense?—Yes; there would be constant expense in the consumption of fuel.

Is the original cost of such a rope heavy?—Yes.

Is the wear and the tear considerable?—Yes.

Has it to be often spliced?—Yes; the rope on the Liverpool tunnel is spliced twice a week, I believe.

Are the sheaves and the pulleys that the rope runs upon likely to break and get out of order?—Yes.

What is the number of those pulleys in a mile?—220 in a mile, I think.

Do you know any thing of the cost of those pulleys?—From 15s. to 20s. is the cost, where less power is used.

Would not this mode require about three times the power usually expended?—Yes; I should say in the proportion of 15 to 47 by an endless rope.

I am speaking of a single rope?—There would be less waste of power in a single rope, but we must take into account the power to carry it back.

Would it not come nearly to what I have stated?—I have not calculated that.

Have you any objection to stationary power in the midst of a line like the Great Western?—Yes; there is an objection to it in the interruption it would occasion in the rapid transit of passengers and the change of power; those are sufficient objections to it.

What would be the sort of power necessary to draw up a single rope?—It would be pulled back by an engine attached to the end of a single rope, which would draw it back.

If the load be 100 tons, should you not require a rope nine inches in circumference to draw it up?—That is for an endless rope.

Mr. Talbot states, that an endless rope had never been proposed, from the beginning to the end, by the parties promoting the bill, and that calculations based on the assumption that it was to be used were therefore irrelevant.

Mr. Joy is heard in answer to the observation.

Mr. Joy.—Leaving both the endless rope and the single rope, I wish to call your attention to the breaks. There was an experiment stated by Mr. Brunel on the Canterbury and Whitstable inclined plane. Is that applicable to the Box tunnel? Supposing it to be stated by Mr. Brunel, with reference to the Canterbury and Whitstable Railway, "I have been down that plane twice, without a rope in the carraige, alone, with nothing but a break to check the carriage, and allowing it to run all its full velocity; by the break it was stopped in sixty yards.—How many passengers were there in the carriage? We were five only; of course, I did not try an experiment of that sort with many passengers.—Was it fully loaded? No." I would ask you whether that gives at all a sufficient explanation of the practicability of stopping such trains as would usually go on such a line as this; upon such an inclination as the Box plane?—No; because the power of the break is inversely as the load; and though you might stop a wagon loaded with five persons (I believe the average weight of a man is 150 lbs., which would be 750 lbs. plus the weight of the wagon), though it might be easy to stop that with a break, it would require a greater power by the break to stop it with a greater load—a power greater in proportion to the load. You cannot infer much from that experiment.

Supposing the carriages to start from the top of the plane in a state of absolute rest, what resistance would be required in order to limit its speed to 30 miles an hour?—It will be the resistance of the same number of pounds per ton, whatever be the limit of the velocity. The circumstances will be these: a train descending a slope of 1 in 107 has a downward tendency, which would be balanced by 12 lbs. per ton; and, of course, whatever the velocity you want to restrict the train to, the break should exert a retarding force, amounting to 12 lbs. per ton.

Taking those data, what resistance would it be necessary to exert through a distance of two miles and a half, 7,588 feet?—To limit the velocity to 30 miles an hour, supposing it to begin from a state of rest, the trains starting from a state of rest at the top, and being allowed to proceed by gravity only, without power, would acquire a velocity of 30 miles an hour after passing over 5,612 feet. Then supposing the break to be applied, so as to check any further increase of velocity, it must exert a force of 12 lbs. per ton in order to do that, and that

force must be exerted through the remainder of the slope, which would be 7,588 feet; and the total force would be equivalent to 4,500,000 lbs., raised a foot high.

You have stated that, on the supposition that the train starts from a state of rest; is it not notorious that they constantly do start with a considerable degree of velocity?—They never do start from a state of rest.

At what sort of speed do the trains generally arrive at the summit of such a plane?—At the top of the slope on the Manchester Railway they generally arrive at the rate of 20 miles an hour.

I need hardly ask you whether the increased velocity you have spoken of would not then be much more dangerous?—The velocity would be much more increased if it broke loose from the break.

If Mr. George Stephenson should have stated that the break often fails to act; is he correct in that?—Yes; I have seen it frequently fail on the slopes on the Manchester Railway.

Did you ever find that inconvenience yourself when making experiments on that Railway?—Yes.

On an inclined plane of 1 in 96?—Yes; I have seen it totally fail with a train of goods; it was burnt; the friction burnt it.

Just state the particulars of that?—I was descending the slope of 1 in 96 on the Manchester Railway, with a train of goods; the engineer let the train run down for a considerable time without the break, and we obtained a velocity that appeared to me to be exceedingly dangerous. I ordered him to apply the break, but the break totally failed; it was burnt. A signal was made to us by the road police to stop, but the train did not stop for a considerable distance from the foot of the slope. When we descended we found that the wheel of one of the wagons had broken, so that both wheels dragged along the rail during the descent, forming a more powerful break than the common breaks, and, notwithstanding this, the train went down with this furious velocity.

Do you know what the velocity was?—I can only conjecture that it was something very great; I should say from forty to fifty miles an hour.

Have you ever had any other misfourtune of the same kind in a curve?—Yes, I did; I recollect an instance of it in a curve or bend in the line; that was not on a slope; it was nearly level.

State the circumstances?—I was proceeding from Liverpool to Manchester with a train of passengers, and at a bend in the line, where, from the flexure of the road, the engineer could not see a great distance before him, it happened that a train of stone wagons was occupying the road in advance; a signal was made to the engineer by the road police to cut off the steam and put the breaks on to retard it; and he alleged that he did so; but the velocity continued to be so great, notwithstanding the breaks, that we came against the train of stone wagons, and smashed them all to pieces; the wagons were broken all to pieces, and the stones thrown about, and the framing of the engine, though of strong iron, was broken.

Did you knock the stone carriages to pieces?—Yes. We were protected by the engine and the springs; some of the passengers were bruised a good deal. There are provisions made in the carriages that carry passengers to protect them from the effects of collision, but there are none in the case of stone wagons.

Was this upon an embankment or a cutting?—It took place in a cutting quite sufficient to hide the wagons.

What is the length of the radius of the curve where this accident took place?—It is a very considerable radius.

Mr. Joy.—Do you know the radius at the bottom of Box Hill?—It is stated to be three quarters of a mile.

If you were in a cutting would not that aggravate the difficulty, as you would not see the wagons before you?—Yes, it would.

What is the distance of the curve from the end of the Box Plane?—I believe it is stated to be a quarter of a mile.

In your judgment, is it sufficient to prevent any injury at that distance?—There will be great danger of having undue velocity; and on arriving at the curve, if the break should fail, the engine would arrive at the curve with very considerable speed. A quarter of a mile would make very little abatement.

If it should be contended that a quarter of a mile is sufficient to obviate any aggravated inconvenience from the velocity, is that correct?—If accidental velocity be acquired it is not, but if all precautions are

taken there is no danger in arriving at the curve; but upon the trains breaking loose, and acquiring that velocity that the descent would give them, there would be danger.

Is it not objectionable that there should be such a curve at the bottom of an inclined plane?—Yes; it would be better further off.

Though a quarter of a mile is sufficient for the expenditure of the common power, is it not insufficient for the expenditure of the dangerous power acquired by that increased velocity?—Yes, it would be.

In your judgment, supposing the train to be worked by a single rope, and such rope were to break, would there not be great danger?—There would be danger arising from the train being precipitated down.

If it is the opinion of Mr. Brunel, that there would be no great danger if the rope broke and that the slightest resistance of the break would stop it dead, is not that erroneous?—I do not agree in that at all; I do not think any resistance would stop a train dead; it would gradually stop it.

Mr. Brunel says he has not calculated the amount of velocity that would be acquired; have you calculated the amount of velocity acquired in falling down these slopes?—Yes.

Just state what it is without any break?—A carriage or train, commencing from the top of the Box Hill Incline, from a state of absolute repose, supposing it not to be propelled by any power, would at the foot of the slope have a velocity of forty-six miles an hour by gravity only, and the time of descent would be six minutes and a half. I omit the small fractions.

That is allowing the friction of nine pounds a ton?—Yes, it is.

That is assuming the train to descend with any power whatever, and to commence from a state of rest?—Yes; and if it does not commence in a state of rest, you must add to the forty-six miles an hour the velocity that it had at the beginning.

If it was starting at the rate of twenty miles, it would get up to sixty-six?—Yes.

Would not that be perfectly serious and formidable?—That is a matter of opinion; I am not afraid of those high velocities if the road be straight and level; but the curve which takes place in a quarter of a mile from the end of the plane would render it quite objectionable.

Quite formidable and dangerous?—Yes.

There would not be sufficient space in that quarter of a mile to correct such extreme velocity?—No, nothing like it.

Mr. Joy.—Suppose it is contended that the danger was reduced to nothing almost, because it was in cutting?—The difference only would be this, that if they were thrown off the rails, they would not be thrown over an embankment, but against the side of the cutting; there would be a difference of result likely to arise, but not a diminution of the chance of being thrown off the rails.

Mr. Locke states he descended the tunnel on the Liverpool and Manchester when the break was not applied at all; have you calculated what must be the speed there?—Supposing the wagon to descend from a state of rest at the top of the tunnel (I speak of the tunnel for goods, 1 in 48,) the velocity acquired at the foot would be fifty-four miles an hour.

If Mr. Locke should represent that to be not accompanied with danger, must not it have been in consequence of previous precautions specially taken on the occasion?—Yes, oh certainly; because accidents have happened where the trains have broken loose in that tunnel, and the wagons have been all smashed to pieces.

Is there to some extent a natural tendency for the engines to get off the rails produced by the centrifugal force upon such a curve as that you have mentioned?—Yes, there is; and for that reason curves are inadmissible, except with a very large radius. When a body is moved in a circle it has a tendency to fly from the centre, and this tendency in the case of trains on a railway presses the wagons against the outside of the curve, and gives them a tendency to run over the rail on the convex side of the curve.

Does not that tendency increase in the same proportion as the square of the speed and the smallness of the radius?—Yes.

Have you calculated the effect of this curve, and the lateral tendency to run off the rails which this speed will produce?—Yes; it is a matter of very easy calculation.

First tell us with a speed of fifty miles an hour and a load of 100 tons?—The outward tendency would amount to 93 lbs. a ton; that would be 9,300 lbs. altogether; that is, with three quarters of a mile radius.

At forty miles an hour?—57 lbs. per ton; that would be 5,700 lbs. altogether.

At thirty-five miles an hour?—47 lbs. per ton; 4,700 lbs.

At thirty miles an hour?—33 lbs. or 3,300 lbs.

These different aggregates of outward pressure wou'd be divided equally among all the parts of the train, and would not apply to any one part?—It would apply at so much per ton, according to the weight of the wagons; if the wagon was loaded with five tons, then the outward tendency would be five times 93 lbs.

Upon that wagon?—Yes.

If they were divided in a space of five feet, each one of those five feet would bear a proportion?—No, it is on the flange of the wheel; it would be divided between the two flanges of the two outward wheels, and the two outward wheels would be pressed outward with the force I allude to; each would be pressed with half the weight I have stated.

If there were ten wagons, each wagon would have a tenth of the whole; and if there were four wheels to each wagon, that tenth would be divided between the four wheels of each of those wagons?—No; it is only the two outward wheels that are affected, and it is divided between them equally.

Mr. Joy.—Does not it follow from what you have stated, that a very slight addition would tend to throw the wheels off the rails?—Yes; a very slight pressure with that tendency would help them over the rails. At the junction of two rails they are very seldom flush. After they have been worked a little time one gets a little lower than the other, and the wheel coming against the corner with that pressure would give it a tendency to go over.

In your judgment, would not the danger of such a curve be extreme with respect to passenger trains from Bath to London?—Yes; I think it would be dangerous, in a train acquiring undue velocity, in descending the slope at Box Hill.

What should you consider undue velocity?—Fifty miles an hour I should consider undue velocity.

Would you consider 30 miles undue velocity?—I consider it is objectionable.

Mr. Joy.—If the Lowther Arcade has been alluded to as an illustration with reference to this tunnel, it must be considered as confined only to its similarity in point of steepness?—To its appearance; slopes upon Railways have a tendency to remove the appearance of danger, and to create its reality.

What do you mean by slopes upon Railways?—I mean inclines; an incline, that has no appearance of danger when you look at it, may have a great deal of real danger in it, though that inclination is one that will not be perceived by the eye.

Do you mean to say that an inclination that does not appear to be dangerous to the eye may be so in point of fact?—Yes, there are slopes on Railways which, while they do not appear to have any danger whatever in their appearance, have a great deal in reality; it would not apply to such a slope as 1 in 1,000.

But some, which are nearly imperceptible, are very dangerous?—Yes.

(To be continued.)

From the London Mechanics' Magazine.

MR. MALLET'S EXPERIMENTS ON THE MANUFACTURE OF WHITE OR BLEACHED PULP FOR THE PURPOSE OF MAKING PAPER FROM CERTAIN VARIETIES OF PEAT.

[We are indebted to the *Literary Gazette* for the following detailed account of Mr. Mallet's process for manufacturing paper from turf, noticed in our report of the proceedings of the British Association. "It was a good-humored jest with the Irish populace," says our good-humored contemporary, "that the Association was planning to distil the bogs into whiskey. But instead of the cup of Circe, Mr. Mallet's manipulation of them would present provision, plenty, and civilization, where now only deserts and wretchedness exist."—Ed M. M.]

A cheap, and yet good substitute for hemp rags, for the purpose of affording a pulp fit for paper-making, has long been a desideratum with the manufacturer. Many attempts have been made to procure one, but the difficulties of finding one such as would suit the required conditions, and the duty and cost of hemp rags have induced adulteration to a vast extent in the paper manufacture. Much of the letter paper now in use owes its apparent thickness, and stiff, close texture to an intimate admixture of the pulp or vegetable fibres with a cream of plaster of Paris or whiting. Brown paper is adulterated with ground clay, and, for similar pur-

poses, curriers' shavings, chopped wool and hair, cotton-flyings, thistledown, and other similar materials, have been occasionally tried; but from none of them has good paper ever been made; and amongst the many experiments that have been attempted with them, being the only one that has been brought into successful use, is that of the manufacture of paper from straw, which answers tolerably for some purposes, though not for writing on, and is now made in some few places very extensively.

Under these circumstances, it appeared probable that nature might afford some vegetable fibres of a texture sufficiently fine for making paper, and which had never undergone any manufacturing process; and, on looking around, the *conferræ* of fresh waters, and also certain varieties of turfs or peats, suggested themselves. The former was soon found too fragile, and its structure unfit to resist the action of the bleaching reagents.

It is generally known that a peat-bog, and especially those of Ireland, consists of various strata, varying in density and other properties in proportion to their depth. The top surface of the bog is usually covered with living plants, chiefly mosses, heaths, and certain aquatic or paludose plants; immediately beneath this lies a stratum varying from only two or three inches to four or five feet, according to the state of the drainage of the bog, of a spongy, reddish brown, fibrous substance, consisting of the remains of vegetables, similar usually to those living on the surface, in the first stage of decomposition.

The chemical state of this stratum is nearly that of some of the papyri found in moist places in Herculanæum; that is to say, having long been exposed to the action of water, at nearly a mean temperature, the vegetable juices have nearly all been converted into ulmin-geine, or impure extractive matter, and the fibres remain nearly untouched, together, probably, with some of the essential oils of the original plants. It therefore seemed that if these fibres, which were apparently sufficiently fine for the purpose, could be separated from their coloring matters, the object would be nearly if not entirely attained; to this, therefore, attention was directed, and was attended with success. It is unnecessary here to enter into any detail of experiments, or into any elaborate disquisition as to the principles concerned, in making a white pulp from this material, either as regards the manufacture or the pure chemist; presuming these to be already understood, the process may be briefly stated as follows:—

The proper description of turf being selected, is soaked in cold water until all its parts are softened, and, to a certain extent, disintegrated: it is then bruised in a suitable engine, in cold water, which is continually agitated and renewed, so that all pulverulent matter (or new dust while the turf is dry,) may be washed off. The so far cleaned fibres are then partially dried by strong pressure, in hair bags, under the hydraulic press, or by other suitable means, and then by suitable seives and winnowing; all roots, sticks or other gross matter incapable of being bleached, are removed. The fine, uniform, brown fibres, or rather minute stems, leaves, &c. &c. are then placed in proper vats, and digested in the cold; that is, at ordinary temperatures, with a very dilute solution of caustic, potass, or soda; preferring that made from what is called in commerce "black potash."

After some time, nearly the whole of the geine and other extractive matter is removed in combination with the alkali. The fibres are again pressed dry, or nearly so, from the digesting liquor, and are now found to be of a dark fawn color, in place of their former deep red brown. They are next transferred into an exceedingly dilute sulphuric acid, containing not more than fifty grains of acid of commerce to the quart of water. They remain in this at the common temperature for some time, generally about four hours, but varying with the kind of turf; this separates the iron and earthy matters from the fibre, and carries off the adhering portions of potass and of ammonia, if any exist in the turf, which is occasionally the case. The fibres are now washed with pure cold water, until they cease to give any acid re-action, and are finally pressed nearly dry, and immersed in a dilute solution of chloride of lime; in this they remain at common temperature until sufficiently white for the purpose of the paper-maker, and on being removed, will generally be found fine enough, as to fibre, for immediate manufacture; but if not, are to be reduced by the ordinary rag-engine, or other suitable machinery.

By this process, it is calculated that about

eighteen pounds' weight of pure white, fine pulp may be procured from 100 weight of the raw or native turf.

Returning now to the solution of the potass, which has carried off the geine, &c., and which is chiefly in fact a geinate of potass; it is treated with dilute sulphuric acid slightly in excess, and filtered through a calico or linen cloth. The potass is taken up by the acid, and the geine and extractive matter precipitate, and are collected on the filter, from which being removed, they are dried by a steam or water bath, and become a valuable pigment.

Vandyke brown has long been known to painters in both oil and water colors. This is it, in fact, in its purest form; it is an extremely rich, glowing color, and valuable for its permanence, as scarcely any agent ordinarily met with is capable of affecting it.

When once perfectly dried, it becomes insoluble in water, and therefore is not in the least deliquescent, but it is still soluble in alkalies; thus possessing two properties eminently fitting it for the uses of the paper-stainer and scene painter, &c. &c. It is perfectly miscible with gum, mucilages, and with oils.

The liquid from which this color or bistre has been separated, now contains various sulphates in solution, chiefly of iron, lime, and alumina; but the major part, sulphate of potass or soda, whichever has been employed; if the former, Glauber's salt may be made from it, and if the latter, alum, as matters of commerce. The quantity of alkali used is small in proportion to the amount of fluid; but if the operations were very extensive, this economical use of them should be attended to.

After the fibre has been some time digested in the solution of chloride of lime, in most cases a resinous-looking matter floats upon the surface of the fluid in very minute quantity. This, when a large quantity is operated on, may, by careful management, be collected, and is found to be a species of artificial camphor, mixed with some gum resin, and probably an essential oil. This substance, or mixture of substances, possesses some singular characters: it would seem probable that the artificial camphor is produced by the action of some fine chlorine upon turpentine, existing in minute quantity in the turf; and it is a curious subject for reflection, that chemistry should thus, as it were, recal into existence and decompose the turpentine existing in, and produced by, trees or plants, which have for hundreds of years ceased to have life, or to exist as vegetables. As the properties, so far as they have been ascertained, of this singular substance are purely chemical, it is unnecessary here to detail them. It is not to be procured from every specimen of red or surface turf.

Some specimens of turf have been met with, unfit, however, for paper-making, from which it would appear to be profitable to manufacture bistre and ammonia, from the very appreciable quantity of the latter they contain.

This fibrous red surface turf, when dry, is extremely tough, and is proposed being also applied as a substitute for mill-boards or board-paper, for the use of engineers, &c. It is capable, when dry, of immense compression by the hydraulic press; and as the fibres naturally lie nearly all in one plane, they thus arrange themselves, so as to give great toughness and flexibility to a plate of it when compressed. Accordingly, suitable masses of this turf are placed in a strong cast-iron, or other vessel, and the air exhausted; the vessel is then filled with a mixture of dilute solution of glue and molasses, at a boiling heat, which fills all the pores of the turf. The masses are then removed, while hot, and exposed to powerful pressure in a hot-press, in a similar way to hot-pressing paper, which reduces them to the required thickness, that of the original mass having been previously properly regulated. The plates so formed, are found, when cold, to be hard, tough, and flexible, and will answer almost every purpose of mill-board. They are not injured by high-pressure steam. Many other substances may be used, according to circumstances, for filling the pores, previous to pressure, as fat, oils, boiling coal-tar, wax, &c. &c.

It is worthy of remark, that the substance proposed being used for all the above processes, is the worst turf for burning; so that the material which is worst, and nearly valueless as fuel, is the best and most valuable, by a fortunate coincidence, for manufactures. If, therefore, as there is reason to believe, the lower strata of turf can, by certain modes of charring, be made a valuable fuel, and the upper and more recent strata are used for the pur-

poses of the various manufactures above adverted to, there is a strong ground of hope that, at a future period, the bogs of Ireland, instead of being contemplated, as hitherto, as a blot and stain upon her fair and fertile champaign, may be looked upon as one of the centres of her industry, and the richest sources of her wealth.

For the Mechanics' Magazine.

STRENGTH OF THE JOURNALS OF SHAFTS.

Lateral strength.

Mr. Roberson Buchanan, in his Essay on the strength of shafts, uses the following rule, which is simple enough, and easy to be remembered: "The cube root of the weight in cwts. is nearly equal to the diameter of the journal." "*Nearly equal*"—being prudent to make the journal little more than less, and to make a due allowance for wearing.

EXAMPLES.—What is the diameter of the journal of a water-wheel shaft, 13 feet long, the weight of the wheel being 15 tons?—$\sqrt[3]{15\times 20}=6{\cdot}7$ or 7 inches.

But the following rules are the most correct, and ought to be used on all occasions:

When the weight is in the middle.

1. RULE.—Multiply the weight in pounds by the length in feet; divide this product by 500, and the cube root of the quotient will be the diameter in inches.

When the weight is between the middle and end.

2. RULE.—Multiply the short end by the long end; then multiply that product by four times the weight in lbs. Divide this product by 500 times the length in feet, and the cube root of the quotient will be the diameter in inches.

When the load is uniformly distributed over the length.

3. RULE.—Multiply the length in feet by the weight in lbs., and one tenth of the cube root of the product will be the diameter in inches.

When fixed at one end, and the load applied at the other.

4. RULE.—Multiply the length of projections in feet by the weight in lbs., and the fifth part of the cube root of this product will be the diameter in inches.*

EXAMPLES.—By rule 1—

$$\frac{33600\times 13}{500}=873\sqrt[3]{873}=9\tfrac{1}{2}\text{ in. dia.}$$

By rule 3—

$$33600\times 13=436800\sqrt[3]{\frac{436800}{10}}=7{\cdot}65\text{ in.}$$

To resist tension or twisting.

It is obvious that the strength of revolving shafts are directly as the cubes of their diameter and revolutions; and inversely as the resistance they have to overcome.

Mr. Buchanan, in his Essay on the strength of shafts, gives the following data, deduced from several experiments, viz: That the fly-wheel shaft of a 50 horse power engine, at 50 revolutions per minute, requires to be $7\frac{1}{2}$ inches diameter; and therefore the cube of this diameter, which is = 421·875, serves as a multiplier to all other shafts in the same proportion; and taking this as a standard, it gives the following multipliers, viz:

For the shaft of a steam engine, water wheel, or any shaft connected with a first power,	400
For shafts in insides of mills, to drive smaller machinery, or connected with the shafts above,	200
For the small shafts of a mill or machinery,	100

From the foregoing, the following rule is derived, viz:

The number of horses' power a shaft is equal to, is directly as the cube of the diameter and number of revolutions; and inversely, as the above multipliers.

Note.—Shafts here are understood as the journals of shafts—the bodies of shafts being generally made square.

EXAMPLE 1.—When the fly-wheel shaft of a 45 horse power steam engine makes 90 revolutions per minute, what is the diameter of the journal?

$$\frac{45\times 400}{90}=200\sqrt[3]{200}=5\tfrac{5}{10}\text{ inches diameter.}$$

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* This last does not directly apply to shafts—but it may be useful for other purposes.

EXAMPLE 2.—The velocity of a shaft is 80 revolutions per minute, and its diameter is three inches. What is its power?

$$\frac{3^3 \times 80}{400} = 5{\cdot}4 \text{ horse power.}$$

EXAMPLE 3.—What will be the diameter of the shaft in the first example, when used as a shaft of the second multiplier?*

$$\frac{5{\cdot}8}{1{\cdot}25} = 4{\cdot}64, \text{ or } \sqrt[3]{\frac{45 \times 200}{90}} = 4\tfrac{6}{10} \text{ in. diameter.}$$

The following is a table of the diameters of shafts, being the first movers, or having 400 for their multipliers, upon the foregoing principles.

TABLE.

DIAMETETS OF THE JOURNALS OF FIRST MOVERS.

Horse power.	REVOLUTIONS.									
	10	15	20	25	30	35	40	45	50	55
4	5 5	4.8	4.5	4.	3.7	3.8	3.5	3.3	3.2	3.1
5	5.9	5.1	4.7	4.4	4.1	3 9	3.7	3.6	3.5	3.3
6	6.3	5.5	5.	4.6	4.4	4.1	4.	3.8	3.7	3.6
7	6.6	5.8	5.2	4.9	4.6	4.4	4.2	4.	3.9	3.7
8	6.9	6.	5.5	5.1	4.8	4.6	4.4	4.2	4.1	4.
9	7.2	6.3	5.7	5.5	5.	4.8	4.5	4.4	4.2	4.1
10	7.4	6.6	5.9	5.6	5.2	4.9	4.7	4.6	4.4	4.2
12	7.9	6.9	6.3	5.8	5.6	5.4	5 2	5.	4.8	4.6
14	8.3	7.2	6.7	6.2	5.9	5.6	5.4	5.2	5.	4.7
16	8.7	7.6	7.1	6.6	6.1	5.8	5.6	5.4	5.2	5.
18	9.	7.9	7.5	7.	6.6	6.2	5.8	5.6	5.4	5.2
20	9.3	8.1	7.4	7.2	6.6	6.4	5.9	5.7	5.6	5.4
25	10.	8.5	8.	7.4	7.1	6.8	6.3	6.	5.9	5.6
30	10.7	9.3	8.4	7.9	7.4	7.1	6.9	6.7	6.5	6.3
35	11.4	9.8	8.9	8.4	7.9	7.4	7.1	6.9	6.6	6.5
40	11.7	10.5	9.3	8.8	8.3	7.8	7.4	7.2	6.9	6.7
45	12.	10.6	9.7	9.2	8.7	8.1	7.6	7.4	7.	6.8
50	12.6	11.	10.	9.3	9.	8.5	8.	7.8	7.4	7.3
55	13.4	11.4	10 4	9.8	9.1	8.8	8.4	8.	7.5	7.4
60	13.6	12.	10.8	10.	9.3	9.	8.6	8.2	7.7	7.6

INCHES DIAMETER.

* The diameters of the second movers will be found by dividing the numbers in the table by 1·25, and the diameters of the third movers by dividing the numbers by 1·56.

S A.

July 25, 1825.

The following communication was in hand before the conflagration, and should have appeared in the January number, but from the confusion into which every thing preserved was thrown, gave it the go by. We will now give it a place, and commence it with the P. S., that we (understanding fully the importance of the *first person*,) and our readers may have the benefit of its reasoning.

We bespeak for it an attentive perusal, and shall be gratified to be made the medium of communication for answers to the following queries, as well as of queries from D. F. and others, in relation to any subject proper for this Magazine.

QUERIES RESPECTING VERTICAL AND HORIZONTAL WHEELS, AND HEATING LARGE BUILDINGS.

P. S.—If you are in want of a caption for the following communication,—as you editors are fond of a title that will attract attention to an article,—you may head it with "*The advantages of the Mechanics' Magazine and New-York Farmer.*" The propriety of which, in a three-fold view, may be thus inferred: If any one is induced by the suggestions herein made, to subscribe to your journals, in the hope of benefitting himself in this way, he will probably find his advantage in it; if he pays his subscription as he should, your advantage will be apparent; if any of your readers answer my questions to my satisfaction, I shall certainly derive advantage from it. By this, I flatter myself, you will perceive that, although I *have* evinced some ignorance in this, I have been to school long enough to learn the proper grammatical relations of "I, Thou, He;" and albeit, in this enumeration of advantages I have committed the blunder of placing the "first person" last, the transposition is unimportant, as I am satisfied that you will not suspect me of such ignorance as not to know that most importance is to be attached to it.

4th Dec., 1835.

Mr. Minor,—Among the many advantages to be derived by artists and scientific men from such valuable journals as yours, is one, of which they avail themselves so little, that they appear not fully to appreciate it. I allude to the facility they afford of obtaining information on any subject, by questions proposed to the readers of them. In this way they might be made a good substitute for the *converzationes* so common throughout Europe, and which are the means of diffusing the lights of science so extensively; with this advantage: that a question inserted in them, instead of being put to a select few, would be propounded to all the learned in art or science throughout our widely spread territory.

It is frequently the case that a person is

so situated that he may not know where to look for information upon a particular subject, although it may be abundant, or easily accessible to those whose business or reading may have lain in that path.—Such are frequently deterred from seeking information in this manner from the fear of exposing their ignorance; not reflecting that the most knowing were once as ignorant as themselves, and are indebted chiefly to others for their present superiority. Partly with the view of setting an example in this respect, and partly for the purpose of obtaining information that I cannot readily find elsewhere, I shall propose a few questions for insertion in your Mechanics' Magazine and Farmer, giving your readers leave to credit me for as great ignorance as they please, if they will but answer my questions; for which I promise them my thanks, and a willingness to help them out of similar difficulties, if it should lie in my way.

Questions.—Can a stream of water be used to as much advantage, or made to do as much work, upon a vertical or tub-wheel as upon a horizontal one; and if so, what is the best construction for one, and the cost of building it? Will the same quantity of water that is let, in a thin sheet, upon a horizontal wheel, produce the same effect if let in solid column upon a vertical wheel under the same head and fall?

What is the best and most economical mode of heating large buildings—by introducing heated air from a furnace—by pipes, heated by steam, carried around the different rooms, or by similar pipes, filled with boiling water? What is the size necessary for a furnace to heat a room or a house of any given dimensions—what should be the size of the flue for heating the whole house—what that for heating a particular room—what the best construction for the furnace,—and what quantity of fuel (wood or coal,) will be consumed per hour (if the fire be kept up day and night,) upon the hot air plan—and what the cost? What are the respective properties of furnace, boiler, pipes, &c., upon the other plans—the best construction and cost? Are pipes of hot water, which are used to such advantage in warming houses in England, sufficient for the purpose in a country where the winters are so intensely cold as ours sometimes are?

Yours, D*** F*****.

COMPOSITION AND SPECIFIC GRAVITY OF DIFFERENT KINDS OF GLASS.

Ordinary flint-glass, according to Mr. Faraday's analysis, consists, in 100 parts, of silica 51.93, oxide of lead 33.28, potash 13.77, with minute portions of other substances. A specimen of the same kind of glass, manufactured for telescopes by the late M. Guinand, yielded the same chemist, silica 44.3, oxide of lead 43.05, and potash 11.75. Mr. Faraday found the specific gravity of M. Guinand's glass to be about 3.616, that of ordinary flint-glass 3.290, that of plate-glass 2.5257, and that of crown glass 2.5448.

Glass has usually been considered, without much actual inquiry into the subject, to be strictly a chemical combination of its ingredients, and in all respects a very perfect artificial compound. This, however, is far from being the truth, as will appear from the following facts. That the alkali in common glass of all kinds is in a very imperfect state of combination, many circumstances concur to evince. For example, Mr. Griffiths has shown, that if a small quantity either of flint-glass, or of plate-glass, be very finely pulverized in an agate mortar, then placed upon a piece of turmeric paper and moistened with a drop of pure water, strong indications of free alkali will be obtained; and that if the pulverization be very perfect, the alkali can be detected in other kinds of glass, containing far smaller quantities of it. This proves, that in whatever state of combination the alkali may be, it is still subject to the action of moisture. That flint-glass is by no means a compound resulting from very strong chemical affinities, and that the oxide of lead which it contains is as imperfectly combined as the alkali, has been shown experimentally by Mr. Faraday, and also appears from the tarnish which is produced on its surface by exposure to sulphuretted vapors, owing to the combination of sulphur with the lead. Glass which has long been exposed to the weather, frequently exhibits a beautiful iridescent appearance, and is so far decayed, that it may be scratched with the nail. The glass of some bottles of wine which had lain in a wet cellar near the Bank of London upwards of 150 years, examined by Mr. Brande, was soft, and greatly corroded upon the surface, in consequence of the partial abstraction of its

alkali. After reciting some of these facts, and others of a similar description, Mr. Faraday observes, "Glass may be considered rather as a solution of different substances, one in another, than as a strong chemical compound; and it owes its power of resisting [chemical] agents generally, to its perfectly compact state, and the existence of an insoluble and unchangeable film of silica, or highly silicated matter, upon its surface." See Mr. Faraday's Bakerian Lecture on the manufacture of glass for optical purposes; Phil. Trans. 1830, pp. 46—50.—[Parke's Chem. Cat., by Brayley. (Arcana, &c., 1835.)

CARRIAGE WHEELS.

On the 27th of May, at the Institution of Civil Engineers, Mr. Walker's paper, on the subject of the most advantageous form for wheels of different kinds of carriages, having been read, a member remarked that there were some practical objections to the use of horizontal axles, which were not alluded to in Mr. Walker's communication—one, the difficulty of making the wheel perfectly secure from coming off the axle, as a greater strain is unavoidably thrown on the linchpin. The wheels of ordinary country wagons are usually much dished, and the axles slightly inclined downwards, by which arrangement the principal strain is thrown on the shoulder of the axletree, and a very ordinary description of linchpin will answer the purpose As far as regards friction, and, consequently, an easy draught for the horse, the straight axle and cylindrical wheel have the preference; but, for safety, strength, and durability, he thought the inclined axle and dished wheel superior; besides which, there exists much practical difficulty in constructing carriages with horizontal axles and cylindrical wheels.—It was remarked, that one reason for the conical wheel being so much adhered to in practice, was the greater liability of the tire on the cylindrical wheel to get loose; by the constant rolling of a heavy weight frequently on a small extent of surface, the tire becomes slightly elongated, and, on a cylindrical wheel, gets loose, and may occasion accidents; the conical wheel provides against this, by its greater elasticity, and the tendency it has to become more flat in the dishing, and, in a slight degree, to stretch out the periphery. It was stated that, at first, the cylindrical shape was adopted in Jones' patent iron wheels; but it was found that, with upright wheels, the width of track was required to be seven feet, and some of the streets do not admit of such a vehicle passing; also, in crowded thoroughfares, the nave is exposed, and liable to come in contact with other carriages. It was stated, that a wheel of a new construction had lately been attempted, and was likely to become an improvement; the rim and nave are of cast-iron, and the spokes of wrought-iron; a wooden band is put round the cast-iron rim, which again is surrounded and fastened on by a wrought-iron tire, secured in the ordinary manner. It was mentioned that, in Austria, cylindrical wheels are invariably used for wagons and heavy carriages, but for light vehicles the dished wheel is generally preferred. A member stated, that in the neighborhood of Edinburgh, the common stone carts belonging to the Cragleith, and other quarries, are generally made with broad cylindrical wheels.

On June 3, the conversation on the subject of the best form for wheels of carriages was resumed. An ingenious method was adopted by Messrs. Jones, to exhibit the friction occasioned by conical wheels; a carriage was run upon the edges of loose boards, placed side by side; it was shown that, while the board under the middle part of the wheel remained stationary, that at the outside was pushed forward, and the board on the inside, backward; such, however, can only occur when the whole breadth of the wheel touches the ground, which is seldom the case, a wheel of nine inches having frequently a bearing of only three inches, in consequence of the middle tire being made of larger diameter.—[Arcana, &c., 1835.]

RUTTER'S HEAT PROCESS.

Dr. Daubeny brought before the meeting the economical employment of coal-tar in connexion with water as fuel, according to the method lately suggested by Mr. Rutter.* A discussion then arose as to whether the water in this case acts chemically or mechanically, or both, in facilitating the combustion of the tar. Mr. Macintosh stated that by repeated experiments he had found

* Originally suggested by Capt. Morey, of New-Hampshire.

that coal-tar gave no more heat when burned than an equal weight of *splint* coal, the kind preferred, where a long con inued heat is required. Mr. Low also stated, that from long experience he could affirm, that the use of water along with coal-tar was productive of no benefit whatever, and that 3 gallons, or 33 lbs. of coal-tar, give an equal amount of heating effect, fully, to 40 lbs. of coke, made from the Newcastle coal of the Hutton seam. From the discussion on this subject, which was protracted for some time, it appears to be established—1. That tar may be used as fuel, but that it does not give much more heat than the same weight of the best coal. 2. That when mixed with water, it flows more easily through tubes, but does not appear to evolve more heat than when used alone.—[Jameson's Journal.]

From the London Mechanics' Magazine.

VENTILATION OF STAGE-COACHES.

Sir,—Permit me to offer to the public, through the medium of your widely extended Magazine, a hint or two from an old traveller, on the subject of stage-coach ventilation. Many others as well as myself have doubtless been annoyed by the *aerophobia* of many who travel by our public carriages, and the pertinacity of such persons in keeping the windows closed, for fear, as they say, of catching cold. Such persons have yet to learn that colds are more frequently the consequence of closely confined air in a badly ventilated apartment, than by free exposure to the wind and weather. Some people seem to regard fresh air as poison, and do all in their power to exclude it; for my own part, I think it is the only one of the numerous blessings of Providence that cannot be taken to excess.

The mode of ventilation I would suggest, is simply this, that the sashes of mails and other stage-coaches, instead of being glazed, as at present—the panel formed by a pane of glass—should be made with wire-gauze, such as is now extensively in use for window-blinds. The vehicle would by this means be amply ventilated without annoyance to any one by currents of air; and, in case of rain, the sashes might be kept up without the choice of evils at present experienced, either to be wet through or suffocated.

AN OLD TRAVELLER.

From the Harrisburg Intelligencer.

IMPORTANT DISCOVERY.

In our last, we noticed the important discovery of Peter Ritner, Esq., of smelting iron ore with mineral coal. It will be a new era in the iron manufacture in this country. The moment we pass the Alleghany mountains, running from northeast to southwest, nearly through the middle of the State, we come into the bituminous coal region. The rocks in this region, reaching to the Rocky mountains, are horizontal, and frequently alternate with iron ore and bituminous coal. This is the case at Karthaus, on the west branch of the Susquehanna, a few miles above the termination of the canal extending to Philadelphia. The process of smelting iron ore with mineral coal, has for some time been known in Europe, and it has been on this account that one kind of iron could be made in Great Britain, and sold in this country under a duty of $30 per ton. Thousands of dollars have been expended in this State, and hundreds of enterprising men have been ruined, in their experiments to discover this method of making iron. A year or two ago, the Legislature incorporated a company, with an immense capital, to make the experiment, as it was thought to be beyond individual enterprise.

At length, however, Peter Ritner and Joseph Loy, with limited pecuniary means, have erected a furnace on the plan of the coke and iron furnaces of Wales, and succeeded in making the finest iron for foundry and many other purposes.

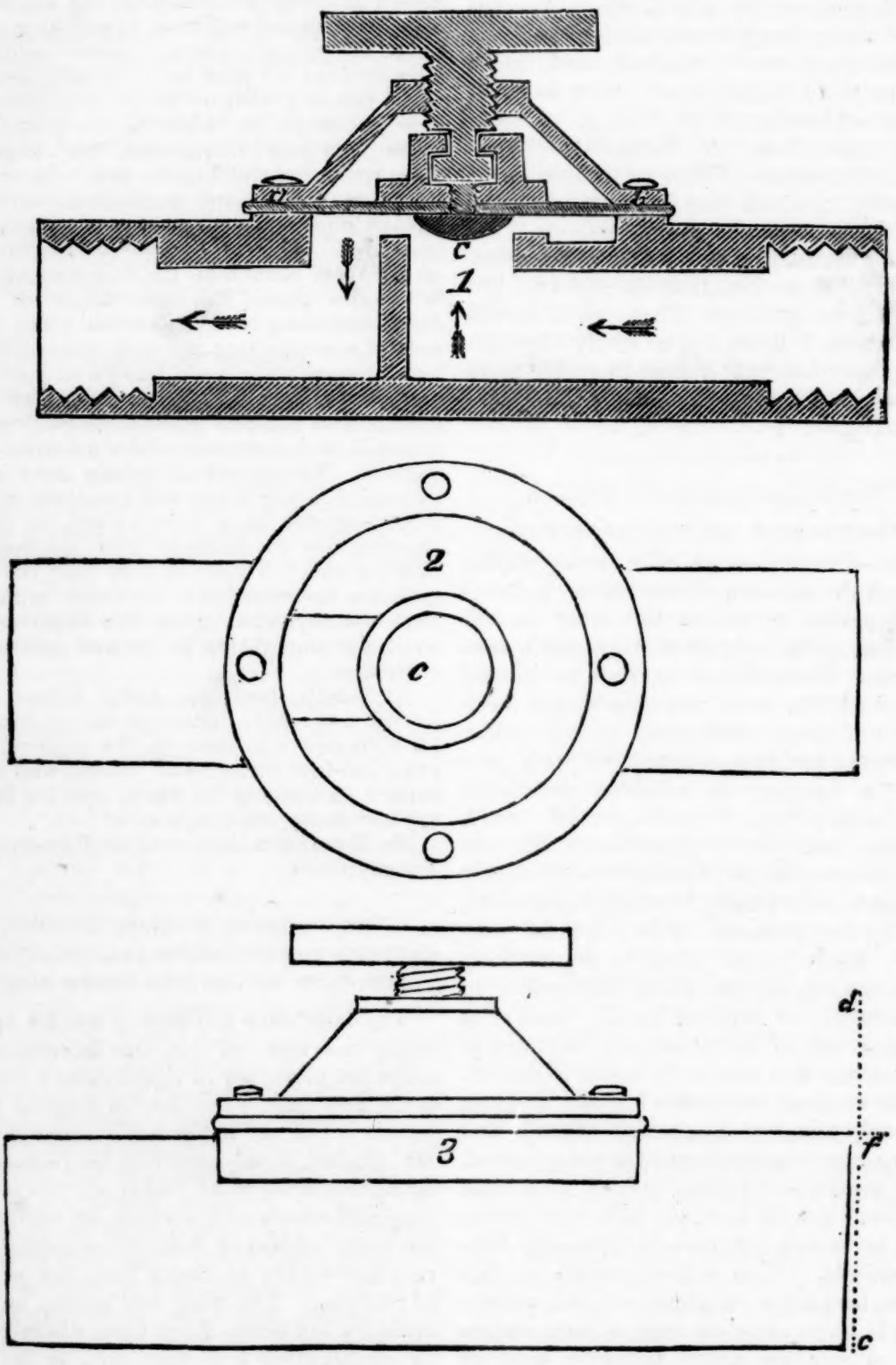
Mr. Ritner is a brother of the Governor of Pennsylvania.

From the London Mechanics' Magazine.

CARTER'S PATENT VALVE FOR REGULATING THE FLOW OF GAS AND OTHER FLUIDS.

The apparatus hitherto in use for regulating the flow of gas has been formed upon the principle of the ordinary liquor-cock, and that, even for its original purposes, is but an imperfect instrument.—Mr. Carter, in constructing his new apparatus, has altogether discarded the cock-plug and substituted a valve, by which all the parts subject to friction are kept separate and totally excluded from the action of the gas. The plug and socket of the ordinary cock are acted upon chemically by carburetted hydrogen gas, be the instrument ever so well constructed and of the very best metal; and to shield them from corrosion, and prevent their becom-

CARTER'S PATENT GAS VALVE.



ing in consequence immoveable, they must be frequently lubricated with oil or some other unctuous matter. Now it must be evident, that where oil can be admitted as a lubrication there must be a way for the escape of gas, in consequence of its very volatile properties; hence the frequent annoyance to consumers by escapes of gas, and the losses to proprietors by the waste from innumerable leaks, which, though trifling upon a single service or street burner, amount upon the aggregate to a very serious sum.

Mr. Carter, by a simple and novel arrangement, has succeeded in keeping all the parts of his apparatus which are subject to friction entirely separate from the gas; and in wholly confining the gas to the conducting pipe when shut off. The valve by which the flow is regulated can neither stick fast nor leak; and any escape of gas is rendered impossible.

We anticipate from the introduction of this improved valve a great increase in the consumption of gas; for there need be no longer any danger of explosion from the accumulation of the inflammable fluid in cellars, or of annoyance from its escaping into the apartments of dwelling-houses where gas-lights may be used.

Description of the Engravings.

Fig. 1. A longitudinal section on the vertical line *d e*, fig. 3.

Fig. 2. Section on the horizontal line *f*, fig. 3.

Fig. 3. Geometrical elevation of the apparatus complete.

The figures are of the full size, and represent the half-inch service-valve.

At *a*, fig. 1, is a cap, secured firmly by screws, which serves the purpose of fastening and protecting the pliable substance *b*. When the gas is to be admitted this pliable substance is raised by the screw through the centre of the cap; and when it is desired to shut it off, it is pressed upon the aperture *c*.

In fig. 1 this pliable substance may be described as a neutral point, neither raised nor depressed, although partially open; but when raised by means of the screw as much above the level as it requires to be depressed for the purpose of shutting off the gas, the column of fluid on passing through the aperture (*c*) expands into a column of more than eight times the capacity of the service; consequently, the small elevation of the valve requisite to prevent any undue strain upon the pliable substance *b*, is more than sufficient to carry as much fluid as the diameter of the pipe can convey.

The apparatus, when placed in the position of figs. 1 and 3, with a fall towards the main on the one side, and a fall towards the meter on the other, can never be choked by condensation; and if placed in the position of fig. 2, or vertically, it must be evident that no inconvenience can ever accrue from any accumulation of condensed matter.

The valve may be made of any dimensions, so as to suit equally the smallest burners and the largest service-pipes.

In applying this valve to water-works, Mr. Carter proposes to make the cap cylindrical which covers and secures the pliable substance, so that the disc may be extended to the full dimensions of the enlarged column; the extended disc will afford a protecting resistance against the pressure of the enlarged column of water upon the pliable intervening substance.

From the London Repertory of Patent Inventions.

INSTANCES OF SPONTANEOUS COMBUSTION, DETAILED IN A PAPER READ BEFORE THE ROYAL IRISH ACADEMY, 25TH MAY, 1835. BY M. SCANLAN, ESQ.—In the beginning of last March a fire broke out in the extensive turpentine distillery on Sir John Rogerson's quay, belonging to Mr. John Fish Murphy, which is separated from my chemical factory by Windmill Lane. The fire, which was speedily got under, was confined to a heap of what is termed, by turpentine distillers, chip cake, and from the circumstances under which it occurred, could not be attributed to any other cause than the act of an incendiary, or to the spontaneous ignition of this chip cake.

As spontaneous combustion of this substance has never occurred before in Mr. Murphy's distillery, nor in that of his father, an extensive distiller of turpentine, for many years, at Stratford in Essex, I, at first, doubted that the fire could have originated in this way; however, on inquiry, I found his mode of working had been, on this particular occasion, different from that

usually employed in his distillery, and, experiments which he kindly permitted me to make, have since proved beyond doubt that combustion did take place spontaneously.

Raw turpentine, as it comes from America, in barrels, includes a considerable quantity of impurity, consisting of chips of wood, leaves, and leaf stalks.* It was the practice, in Mr. Murphy's distillery, as it is in England, to heat the raw turpentine up to a temperature of about 180 deg., as I found by plunging a thermometer into one of his large copper pans, and to strain the turpentine, thus liquified, from the impurities, previously to introducing it into the still, where it is submitted to distillation in the usual way, with a portion of water, yielding turpentine oil, which distils over along with the water and rosin which remains behind in the still. The chips, when separated by a wire strainer, still retain a quantity of adhering turpentine worth saving, and with this view are transferred to a large close vat, where they are exposed for some time to the action of steam furnished by a boiler kept for this purpose, as well as for steaming the empty barrels, in order to remove any turpentine that may adhere to them. Still, however, the chips are a good deal imbued with resinous matter, and in this state form a loose porous mass, which the turpentine distiller calls chip cake, a material which is used by the poor in the neighborhood as fuel.

As long as the process I have just described was pursued, which is the London mode, and that which produces the best rosin, no accident occurred from fire in Mr. Murphy's premises, although I have frequently seen immense heaps of this chip cake collected together in his yard; but, on making trial of a different plan, namely, that practised by a Dublin distiller, Mr. Price, of Lincoln Lane, the accident in question occurred.

On this occasion, the raw turpentine, together with its impurities, was put directly into the still, along with the proper quantity of water, and the boiling rosin at the end of the operation strained from the chips.

The chip cake resulting from a single operation thus conducted, was laid in a heap outside the still house at 3 o'clock in the afternoon, and at midnight was observed to be in flames.

In the first mentioned process, it is obvious the chips were never exposed to a higher degree of temperature than 212 deg.; but in the latter, especially when it is the object of the manufacturer to make amber rosin, the temperature to which they are exposed is much higher.

The first experiment I made was on the 16th March. I found the temperature of the boiling rosin, in the still to be 250 deg., when the turpentine, oil and water had been distilled off, the fire just drawn from under the still, and when the liquid rosin was in the act of being strained from the chips which were introduced into the still with the turpentine.

I had the whole of the chip cake resulting from this distillation carried into my own yard, upon a wire screen, and left in the open air, with a view of watching its progress.

The temperature increased gradually in the centre of the heap, although externally it became quite cold and brittle. In four hours, in fact, a thermometer thrust into the centre of the *porous* mass indicated a temperature of 400 deg., a good deal of vapor was now given off, and the adhering rosin in the heated parts began to acquire a high color; the smell could be perceived at a considerable distance from my premises; it was a mixed smell of pitch and rosin.

The chip cake, in this experiment, was first exposed to the air at 1 o'clock in the afternoon, and, though it rained during the night, at half past 7 the following morning it burst into a flame.

In a second experiment I placed the chip cake in an open tar barrel, having three holes bored in its bottom, about two inches diameter each, and it did not take fire till the expiration of thirty-six hours, but the temperature of the mass was lowered by removal from the wire strainer to the barrel, and besides, I am of opinion the limited access of air retarded the combustion.

In a third trial which I made, combustion took place in five hours; but in this expe-

* The following extract from the letter of a French turpentine merchant, will account for the presence of these foreign bodies. To obtain the turpentine "the fir timber is chopped about a man's height down its side with an axe, not hand deep, and afterwards higher up. The turpentine or rosin is scraped up from the foot of the tree. That which is on the side wound, when scraped off, is white, and is called galley pot, of which the burning incense is made. It does not yield so much turpentine spirit as the pat."—[Edit. of Records of Science.]

riment the temperature of the boiling rosin drawn from the still was 260 deg., and the chip cake was laid, as in the first experiment, on the wire screen; the wind, too, was very high. The screen, in this case, was raised a few inches from the ground, in order to let the rosin, as it melted, drip away, which it did in abundance.

It appeared to me as if the porous mass became slowly red hot, in the centre, like a pyrophorous, and as if the vapor and gaseous matter arising from the decomposed rosin which lay immediately beneath, were inflamed on coming in contact with it. I was standing by when it suddenly burst into flames, and I thought, at the time, had the melted rosin been permitted to drop into water, or had it fallen to such a distance as not to be kept liquid by the radiant heat from the red hot mass above, that there would have been no flame, but silent combustion.

I have since learned from Mr. Price, in whose distillery it has always been the practice to put the unstrained turpentine into the still, that he was well aware of the fact which it is the object of this paper to record, from a fire having occurred several years ago on his premises, when in the possession of his predecessor, Mr. James Price, and that ever since they cool down the chip cake, immediately on removal from the still, with water, and afterwards use it as fuel under the still.

An instance of spontaneous combustion occurred with my friend Mr. Philip Coffey, of the Dock Distillery, which is worth relating while on this subject.

He had made a quantity of the mixture used in theatres for producing red light, a powder consisting of nitrate of strontian, sulphur, chlorate of potash, and sulphuret of antimony, with a little lamp-black. A paper parcel of this "red fire," of about a pound or two by weight, was left by him on a shelf in a store room where there was no fire nor candle-light: the following day, while reading in an adjoining room, he perceived a smell as if some of this powder were burning, and, on examination, he found it had ignited spontaneously on the shelf, and was actually consumed.—[Records of General Science, August, 1835.]

For the Mechanics' Magazine.

SOCIAL INFLUENCE OF ROADS AND RAILWAYS.

In rude states of society, there are no good roads intersecting a whole country. In consequence, different sections have no intercourse with each other; and there has existed in former ages a multitude of petty kingdoms, fifty miles square, or a hundred miles square, or larger or smaller, according to natural boundaries. These were jealous of each other. Each viewed its neighbors as strangers and enemies; and, having no commercial transactions with them, or but to a small extent, it had little temptation to avoid a state of war. Great nations were first formed where communication was easily maintained between remote places. Thus the making of good roads over the surface of the earth, has been one of the most efficient causes in forming great nations; and the formation of such great nations has destroyed jealousies and prejudices, and has put an end to hostilities between the provinces which now constitute one country, but which before were distinct kingdoms, and had their peculiar languages or dialects.

Railroads will make, in some parts of the world, as great a change in the existing state of society, as good common roads have helped to make in past centuries. They will make intercourse so easy with places two thousand miles distant, that the people of the two places will have literary, religious, social and commercial connexions with each other, too close and valuable, to allow of being interrupted by wars, without extreme necessity.

But not only may railroads be viewed as important by binding together in friendship distant countries, or remote sections of the same country; the system may be applied to the accommodation of the people scattered over the whole surface of our soil in the whole business of social life. When it is considered that as easily as a man can wheel on a common road by his own labor a single bushel of corn, he could move on a railroad, with the same rapidity, a load of more than 1200 lbs., it will appear probable that railpaths for short distances, to main railroads, will be formed for the use of men.

This will be further apparent from the fact that the same power which a man exerts in going up stairs twenty feet high, would propel him forward on a level railpath nearly a mile; and if his carriage in which he moved himself weighed 500 lbs., the additional power necessary to move this, would be only that exerted by a man in raising two pounds twenty feet high, or as easily as a man can ascend a stairs twenty feet, carrying with him two pounds weight, he could propel himself in a car weighing 500 lbs., very nearly a mile. There would be a vastly greater amount of business done over the country but for distances of three, five, eight and ten miles, at which people are from the places where they might do their business.

Many articles of produce, or of the growth of the land, would be vastly more valuable to the farmer but for these short distances over which bulky articles must be carried.

The advantages of the whole public for attending higher schools, and all literary and religious meetings, are incalculably diminished by these distances.

According to Sir John F. W. Herschel, a man working eight hours a day, would exert the power of raising 364½ lbs. ten feet high each minute, or 729 lbs. five feet high each minute. But the power required to raise 729 lbs. five feet high in a minute, would carry such weight forward on a level railroad five times 240 or 250 feet, or more than a fifth of a mile. Thus a man exerting on a level railpath the strength he lays out in his ordinary labor, for only five minutes, may propel a weight of 729 lbs. more than a mile.

A man lays out his whole ordinary strength in walking a mile in fifteen minutes, without any load; but on a level railpath he could, with the same application of power, move a weight of 729 lbs. three miles in the same time. But if we should take all seasons of the year into view, it would be found that in the country a man would as readily do common labor for twenty minutes, as walk one mile; for he must sometimes wade or wallow in snow or mire, when a walk of one mile would be equivalent to half an hour's labor.

Could the country to any great extent be intersected by such railpaths as are here referred to? What then are the difficulties?

1. The cost—a very important consideration. But the cost would be very small, no more strength or solidity being required in the structure than to support at one point, or under one car, about 2000 lbs.

2. Deep cuttings. These would never be needed; for the railpaths are supposed to have but a few miles to run before they enter into larger railroads; and these railroads will be along the vallies of rivers, or at their level at least; the railpaths will easily fall into them; and if they must be extended several miles to avoid crossing a hill, as they are cheaply made, the increased length is no great evil.

3. Inequalities of ground. As to a great part of the minor business and intercourse of the agricultural districts, the course of trade, &c., is controlled very much by the lay of the land. Between two villages five or six miles apart there is a very high hill, or a deep valley and a tract of barren land. This hill, waste, or valley becomes a natural boundary between the people on each side as to social, religious and commercial affairs. Thus the business, social, and ecclesiastical connexions of towns depend very much on their being on a great or easy road, or natural channel of conveyance. If railpaths should be adapted to the inequalities of the ground, so that a level should be preserved, business would flow into these paths just as has been always the case in opening new and better roads; and if the existing course of business should be in some instances greatly disturbed, it would only be a temporary derangement.

4. Want of business. The internal travelling and transportation, social, religious and commercial, in nearly every town in the country, is, I think, from five to ten times all the travelling and transportation it makes out of the territory of the town, even over all the roads and railroads in the nation. There will not then be a want of business for a few judiciously selected railpaths through every well settled township in the Union.

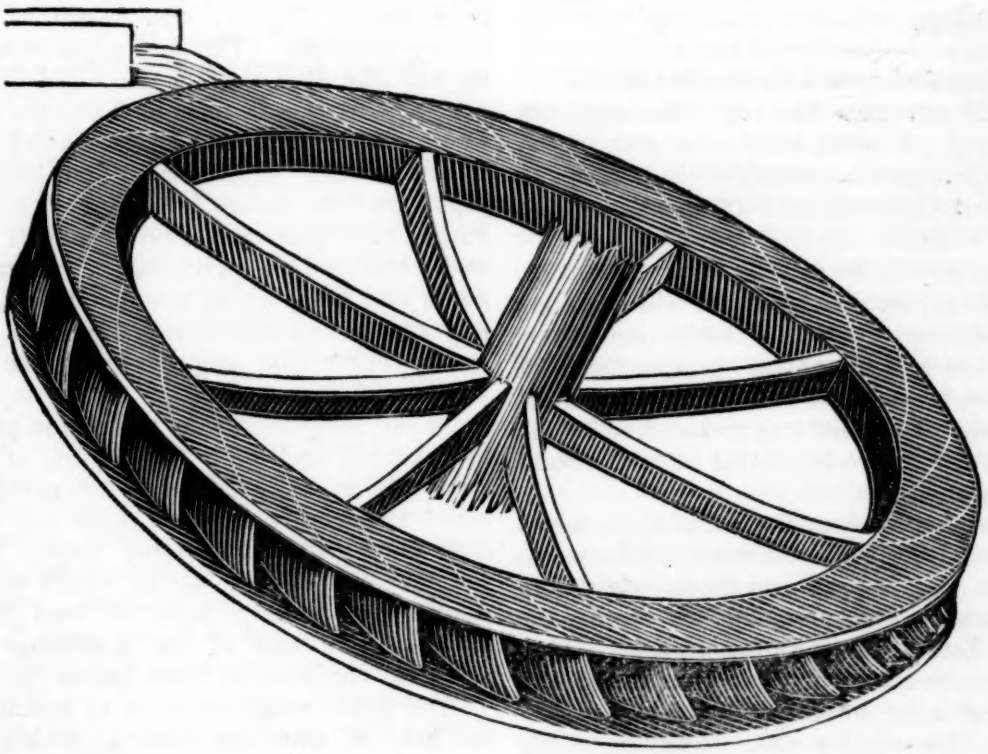
5. Want of funds to build them. They

must be free, and therefore be made by public corporations, towns, cities, counties, or states. If these do not choose to make them, private corporations will make them, for the revenue which they will see a fair prospect of deriving from them. When they have thus succeeded in the most promising routes, other routes will be commenced, and the system will extend. Such a system, if successful, or if only partially practicable, would greatly augment the business and revenue of the main railroads. They would be to these roads like the rills and brooks and smaller rivers to a noble flood that still swells as it receives one tributary after another, and pours its full tide into the ocean by some great city. This, though it may be rich and powerful and proud, owes all its commerce to the labors of farmers and mechanics, scattered widely, whose productions collected in small, and then in larger and larger quantities, till they swell to the mass of goods that fill a great centre of trade.

PUBLICOLA.

The foregoing communication is well worth a perusal. The idea thrown out is a novel one, yet deserving of notice. We wish all manner of prosperity to "*rail-paths.*"

INCLINED WHEEL, FOR SMALL STREAMS.



INCLINED WHEEL for small streams, a substitute for those operated by *animal* power.

We recently examined, at the rooms of the American Institute, the model of a wheel, of which the above is a representation, designed as a substitute for the horizontal, or loded wheel, moved by *animal* power. It is not uncommon, in some parts of the country, to use wheels upon the surface of which horses, mules, or cattle travel, for grinding grain, and for other purposes, for the want of sufficient *water* power to drive the ordinary wheel.

This wheel is neither horizontal nor perpendicular, but a medium between the two, and the buckets are so constructed as to retain the water until the wheel has completed nearly the half of a revolution. This wheel, the inventor believes, may be used on small streams, wherever two, or three, or

more feet fall can be had, with much advantage over any other wheel, as by adopting the inclined position, a much larger wheel, or longer lever, may be used, and therefore a less quantity of water with a trifling fall, may be used to advantage, for many purposes. Its superiority over animal power, consists in its economy, as when it is once prepared it requires neither *provender*, driver, nor replacing with another, when weary and worn out; and it will be readily perceived that the weight of water required is only equal to the traction of the *animal* used on the horizontal wheel.

We consider them well worthy the attention of those who desire to use the kind of power for which they are designed as a substitute.

C. Foss & Justin Ware, of Ohio, patentees, and Andrew Luke, of 352 Broadway, agent.

From the Journal of the Franklin Institute.

REPORT ON THE USE OF THE HOT AIR BLAST IN IRON FURNACES AND FOUNDRIES. BY A. GUENYVEAU, ENGINEER AND PROFESSOR IN THE ROYAL SCHOOL OF MINES.*

(Translated for this Journal by Professor A. D. Bache.†)

This report embraces the observations made during a tour of examination of the furnaces and foundries in the South of France, in some of which the hot air blast is used. The tour was undertaken by order of the director-general of bridges and roads, and of mines.

In remarks upon the subject, a distinction must be made between the furnaces where coal is used and those which use charcoal. The amount of air required is so different in the two classes, being sometimes as two or three to one, that the apparatus for heating it is usually different. The results are, however, nearly the same for both classes. All the furnaces examined use ores from the same part of France. The hot air blast has succeeded best in the furnaces of Vienne (Isere,) the two at Terre-Noire (near St. Etienne,) and those of the Voulte (Ardeche.)

In one furnace, that of Firmy (Aveyron,) the results with this blast were not satisfactory, either with raw coal or with coke. The large establishments of Creusot and Alais, and those of l'Orme (Loire,) have not yet applied heated air. The fuel used in them is coke. At the furnace near Torteron, where the fuel is a mixture of charcoal and coke, the hot air blast has been used to advantage, in regard to the quality of the iron. In the various smelting furnaces in Burgundy and Franche-Comte, where charcoal is used as a fuel, the new process has proved satisfactory.

I. HEATING APPARATUS.

Of these there are various forms in use. The objects sought are economy in heating the air, a sufficiently high temperature, and the preservation of the pipes.—The apparatus used at Calder* (Scotland,) appears to answer the best purpose. It is in use at Vienne, and in one of the Firmy furnaces. The first apparatus put up was like that used at the Clyde† furnaces; this is still used at Torteron and la Voulte, but has, at Vienne, given place to the Calder apparatus. The heating pipes are two inches in diameter, and at Firmy have been replaced by others two and a half inches in diameter. It might seem that these pipes are too small, but experience has sanctioned their use. It is not known how long this apparatus will last; in fact the duration must depend upon the temperature to which the pipes are heated, and upon the nature of the coal. It is believed that the arrangement with highly inclined tubes will outlast those with horizontal ones. The temperature of the air is easily raised above the melting point of lead (604° Fahr.) The cost of the apparatus for each tuyere is about 1200 francs ($240.)

The flame which appears at the trunnel head of smelting furnaces which use coke, has not been applied to heat the blast, although it has been advantageously applied in charcoal furnaces. It would seem that this mode of heating should apply particularly to furnaces in which raw coal is used, on account of the amount of unconsumed combustible matter which issues from the trunnel head; notwith-

* Annales des Mines, vol. vii., Livraison 1.

† This is a translation of extracts from the report of M. Guenyveau, and in parts where the details do not seem to be of special interest, an abstract of his results.

* See this Journal, vol. xv., p. 213, pl. 2, figs. 6, 7, 8, and 9.

† Ibid, vol. xv., p. 209, pl. 2, figs. 1 and 2.

standing which, M. Dufrenoy gives one case, in the neighborhood of Birmingham,* in which the heating apparatus placed upon the platform of the furnace did not answer the purpose. The temperature of the air could not be raised above 360° Fahr., and subsequently it was heated by a separate furnace which consumed four tons of coal for each ton of iron. As, however, the temperature to which the air is heated at the Voulte furnace is below that just stated, the question cannot be considered as decided.

The air blast is generally heated above melting point of tin (442° Fahr.,) and sometimes above that of lead (604° Fahr.,) and even higher. In other furnaces, as at the Voulte and Torteron, where horizontal heating pipes are used, the temperature has been diminished, in order to save the wear of the pipes. At the first mentioned furnace it never exceeds 340° Fahr., being at a mean about 320°, and at the second never exceeds the melting point of tin. At the furnaces of Terre-Noire the heat is carried by Taylor's† apparatus to 572° Fahr. It has been said that the advantages of the hot air blast increase in the ratio of the temperature of the blast, an assertion which, although it appears probable, and has been confirmed by certain observations, is not true in all cases. At the Voulte the results were sensibly the same where the air was heated to 428° and to 320°.‡

Several methods have been used to determine the temperature of the hot air blast. One was to use a common thermometer, with a metal scale; the bulb being inserted into the blast pipe near the nozzle. Another method was to use a slip of lead, tin, or of some fusible alloy, according to the temperature, which was exposed to the air issuing from the hole in the blast pipe.§ At Torteron the alloy was two-thirds tin to one-third of lead.

Great inconvenience has been felt from the leakage of the pipes used in the heating apparatus. These leaks, when they occur in the heating ovens, are only discovered by a deficiency in the yield of the furnace. They occur commonly at the joints, and the liability to them increases with the increased temperature of the blast. The repairs which are necessary alter the supply of air, and thus derange the system of working.

It is a desideratum to render the leakage less common and the means of repair more easy. When these leaks occur, if the fire is not immediately extinguished, the pipes being no longer kept cool by the air passing through them, burn out very quickly. The heating apparatus placed near the trunnel head is free from this defect.*

The effect of these difficulties has merely been to produce a resort to the reduction of temperature noticed at the furnaces of La Voulte and Torteron. The remarks of M. Dufrenoy on the forms of apparatus, confirmed as they are by extensive observation, deserve great attention.

The effects of heating the air upon the quantity and pressure of that passed into the furnace, may be thus estimated. If we suppose the air heated from 60 deg. to 568 deg. Fahr., its bulk will be double, and consequently, under the same pressure, but half the quantity will pass through a given orifice, which would have passed had the air not been heated. Generally, until the area or nozzle of the blast pipe is nearly doubled, the advantage of the hot air blast is not realized. Before this change in the nozzle, the furnace is not duly supplied with air. Besides, the pressure at the tuyere has been observed to diminish with a given pressure at the blowing machine, a fact which may be explained by the resistance of the air moving through the pipes of the heating apparatus, the elbows in which tend to make the resistance quite considerable in amount.

If then the pressure and the quantity of air thrown into the furnace should be the same with the hot and cold blast, the power of the blowing machine must be increased. This has not been found necessary in the English works, where on the contrary they

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* See this Journal, vol. xv., p. 272, pl. 3, figs. 15 and 16.

† Similar to that described by M. Dufrenoy, vol. xv. p. 213.

‡ It may readily be understood why an increase of 100° from 320° to 420° should not produce so sensible an effect as from 220° to 320°, or as from 120° to 220°.—[Translator.]

§ By reference to this Journal, p. 74, vol. xvi., a more convenient method of using the thermometer will be found.—[Translator.]

* If so, it would seem that it must be deficient in heating power.—[Translator.]

have supplied more furnaces with heated air by the same blowing machine, than could be supplied with cold air. Less fuel being consumed in a given time, with a greater yield of metal, less air is required to support the combustion. In these works the power required to supply heated air is estimated at one-tenth more than that employed for the cold blast, for the same weight of ore, but as the weight of the air thrown in is diminished one-fourth, the same blowing machine which supplied three furnaces with cold air will supply four with the hot blast.

At the Calder furnaces, (Scotland,) the pressure of the hot air blast was less than that of the cold air previously used by two-thirteenths, and at the Clyde works by one-sixth. M. Varin estimates the economy from this source at la Voulte works at one-fifth, the pressure being reduced from three inches and a quarter of mercury to two inches and a half.

At the Torteron furnace where the heated air blast has neither changed sensibly the amount of fuel used, nor of iron produced, the blowing machine requires a little more fuel to produce the steam required to move it, than it did when cold air was used. At Wasseralfingen, where the consumption of charcoal has not varied materially by the change from the cold to the hot air blast, they require more power with the latter, a larger quantity of air being necessary in running the furnace. It is not said that the dimensions of the blast pipe nozzle have been changed. At Ancy-le-Franc, in August, 1834, the pressure at the governor remaining constant, that at the tuyere was observed to fall to one-half, when the air was heated. The size of the nozzle was increased, but there was not an adequate power to supply the air required, and the yield of the furnace diminished.

Tuyeres, cooled by water, have been substituted for the ordinary ones in furnaces using the heated air blast; the cooling effect of the blast being taken away, the ordinary tuyere is rapidly burned out. Cast-iron water tuyeres have been found to last longer than those of wrought iron; they wear out in from three to six months.

In many establishments the blast pipe nozzle is permanently attached to the tuyere, an arrangement which answers well when it is not necessary to clean out the tuyeres. When this is necessary, the common arrangement is to be preferred, and this is generally the case in the French works even where charcoal is used.

When the nozzle is not closely fitted to the tuyere, the blast is slightly cooled before it gets into the furnace, and part of it does not pass in.

II. ON THE EFFECTS AND ADVANTAGES OF THE HOT AIR BLAST.

The effect appears to be to increase the heat within the furnace, so that a refractory ore is fused; any stoppage in the furnace is prevented, and the working is more readily resumed after the furnace has been cooled. Less fusible ores may be used, less flux is required for their reduction, the slags are more fusible, and become spongy if water is thrown upon them when incandescent. This property has been observed only in the Styrian furnaces and others where charcoal is used as a fuel, and the ore is a manganesian carbonate of iron. Further, grey pig iron is obtained with every kind of ore, this variety of iron requiring a high temperature for its production. Generally the heated air and combustible gases which issue from the trunnel head, are diminished in quantity, and the heat is more concentrated in the lower parts of the furnace; a source of great advantage, but which causes a more rapid destruction of the hearth and boshes.

The working of the furnace when heated air is used is comparatively easy; there are fewer cases of clogging, and they are readily remedied; the tuyeres are almost always free, no slag collecting and hardening about them. Frequently a clogging in the furnace may be removed by raising the temperature of the blast. The advantages may be succinctly enumerated as follows:

1. A change in the iron, which becomes more grey, and even black, and the slag is more fluid than when cold air is used.

2. An increase in the quantity of ore which a given weight of fuel will bear, whence results a diminution in the quantity of fuel required to produce a ton of metal, after the fuel required to heat the air has been taken into account.

3. A diminution in the quantity of flux, to which there are, however, exceptions.

4. An increase in the daily yield of a furnace.

We do not enumerate among the advantages that of using crude coal, because it has been ascertained both in Wales and at Decazeville, that this may be done with the cold air blast.

In regard to the quality of the iron produced by the hot air blast, the following facts have been collected :

It has been asserted that iron, thus obtained, requires to be remelted when it becomes duly tenacious, and yet the Lyonese founders complain that the iron of Vienna is weak. On the other hand, iron from the Torteron furnace was cast into shells which required more powder to burst them than similar ones made from iron procured by the cold blast, the strength having been nearly double, in the former case, of that in the latter.

In England there appears to have been no sensible difference between the castings made from iron obtained by the two different methods.

The same uncertainty prevails in regard to the forged iron obtained from pigs reduced by the aid of the hot air blast. M. Dufrenoy and M. Debilly, consider the notions prevalent on this subject in England, to be founded in prejudice. My observations in the South of France have shown that there is, if any, a very slight difference in the quality of the iron in favor of that made by the cold blast. At one of the furnaces it was suggested that silicious ores gave a worse iron by this process than by the cold air blast, the great heat facilitating the union of the silicium with the carbon and iron. A careful analysis is required to demonstrate this theory, in favor of the probability of which it may be stated that at Firmy, where a very silicious ore is used, the iron made by the hot air blast is worse than that by the other process, and when refined, produces a worse malleable iron. It is remarkable, moreover, that the best iron is obtained when the ore is in excess in charging the furnace, in which case the iron is reduced at the lowest temperature.

(To be continued.)

The following letter of Mr. Galt to the Glasgow Herald, refers to that gentleman's discovery of a substitute for steam :

"Sir,—Since childhood, gathering gowans on the banks of the *gotts* or ditches of the meadows of Irvine, about 50 years ago, I have been instinctively an observer of hydrostatic effects, and this predilection has led me to an important discovery. Be assured, Sir, I take no more merit than the cock which scraped up the precious stones from the dunghill. It is a substitute for steam, arising from the incompressibility of water. Bramah's press demonstrates that by reiterated pressure, 'by little and little,' vast effects may be produced. It suggested to me that by continued pressure I should obtain similar results ; and I have done it in this way :—It is quite clear that if water be for all practical purposes incompressible, it must follow that a strong box filled with it will be equivalent to a solid. Now, if in such a box there be a moveable wheel, before any water is let in, when water is let in by a pipe that wheel will be set in motion, and so continue, if the water continue to flow out by another pipe. If, therefore, the water flow in a constant stream by a pipe *of a certain size*, and flow out by another pipe of smaller size, the water by the larger pipe will act with pressure on the water in the box, that water having only an outlet by the smaller pipe, and thus keep the wheel in constant motion at the rate the water is driven out of the smaller pipe. The desideratum, then, is a constant stream from a dam for the close mill-lade, as the pipe may be called which takes the water in. Sir, I propose the ocean for my mill-dam. It is clear that if you can, by a pipe in the bottom of a vessel, conduct the water of the ocean into the box in her hold with the wheel, and out of the box into a reservoir lower in the vessel than the surface of the sea, you will acquire a pressure-power to set the wheel a-going, limited only by the weight of the whole atmosphere of the earth, and the weight of the ocean above the level of the box. But, Sir, this course of the water into the box, and then into the vessel, would, however small, in time sink her, unless a mode were contrived to discharge the water issuing from the box back into the sea. By my pressure-syphon this can be effected in a constant stream ; but a common hand-pump, in a small cistern, would be sufficient ; and a simple cock on the pipe which lets in the water from the ocean, or exterior, will at any time serve to stop the wheel, which will go again on opening the cock *vice versa*. The wheel may be so constructed as a moving power as to set paddles a-going. This is the whole of my discovery. Few men have had it in their power to communicate to the public that a stone so precious has by mere scraping been brought to light ; and I say at this moment, with an awful feeling, that I have not been sent into the world in vain, nor been so afflicted without a compensation ; for unless I had been confined to my seat and often lonely enough

in my study, I could not have had this cause to acknowledge the mercy of Almighty God."—[Standard.]

Height of Waves.—Among other proofs of the incorrectness of the assertion, that no waves rise higher than ten feet above the ordinary level, the following vivid description is given:—"During the hurricane experienced to the Northward of Barbadoes by the squadron under the command of the late Admiral De Courcy, (in July 29, 1805,) the *Centaur*, a seventy-four of the largest class, whilst lying-to, had the small boat (a gig,) which was hoisted up at the stern davits, washed away, as well as the poop-lantern, by an enormous wave, which was elevated *many feet* above the highest part of the ship's hull, as it rushed past with impetuous velocity; the portion which struck the ship cleared the poop-deck of every thing!—On the evening of the second day, whilst the hull of our shattered and unwieldy vessel lay rolling in the trough of the sea, the cry of one of the look-out men, of 'a ship coming down upon us,' made those who were holding on, under the shelter of the weather bulwark, spring from their covert to get a peep of the scudding vessel. We jumped upon a carronade, and, with the greatest difficulty, held on, directing our eyes upwards to the position where the stars of the mid-heaven would have been sought for on a calm and clear night! and indistinctly saw a dark object upon the ridge of the towering wave, which was approaching on the weather-quarter. The next minute, a large ship (the *St. George*, 98,) dashed close past our stern with a rapidity perfectly astounding; and, before the eye could be well turned to leeward, she was almost out of sight. The danger was imminent, and, but for the providential circumstance of the *St. George's* helmsman catching a momentary glimpse of the *Centaur*, under the foot of the former's foresail, our doom, and theirs too it is probable, had been sealed. One *spoke* of the wheel to port saved us, and barely so, for the giant ninety-eight's proximity was alarmingly close, in her desperate flight before the furious tempest! If any dependence can be placed upon our eyesight in broad daylight—when much of the heightened peril of the storm seemed to have lessened with the departure of the night—and from intent contemplation, for some hours, of the successive *seas* as these came rushing and doubling onwards, as it were, to wipe away with one brush of their curling and foaming, the glorious and inglorious works of man, which lay like a helpless log at their mercy—we would say, that if a horizontal line had been drawn from the apex of the loftiest wave to the ship, it would have intersected the mainmast about half way up from the deck; which, making allowance for unavoidable error, would give about fifty feet for the elevation of the wave."—[Nautical Mag.]

Fribourg Suspension Bridge.—M. Arago, in a paper descriptive of this bridge, read lately to the French Academy, which agrees in all material respects with that contributed some time ago to this Journal by Mr. Terry, C. E. (See vol. xxiii., p. 50;) makes the following comparison between it and the Menai Bridge:—"The only bridge which, for its dimensions, can be compared with that of M. Challey, is the Menai Bridge, built by the late Mr. Telford, and which joins the Isle of Anglesey to England. The largest ships can pass under this bridge at full sail. But the breadth of the Menai Bridge is only 167½ metres, 516 feet—consequently 301 feet less than that of Fribourg. The surface of Mr. Telford's bridge is about 33½ metres, or 100 feet above the level of the sea at high water. That of M. Challey is 51 metres, or 156 feet above the bed of the Sarmi. M. Candolle has taken the city of Paris as a standard, by which to convey an idea of the magnitude of M. Challey's bridge. He supposes a bridge of only one single span, the length of which shall be equal to the railing of the Carousel, or to the distance between the two corresponding carriage entrances of the two galleries, the level of this bridge being somewhat lower than the height of the towers of Notre Dame, or eight metres higher than the column of the Place Vendome, and you may thus have some notion of the height and length of the bridge at Fribourg."

We have much cause to rejoice at the great advance which has been made in Prussia within these few years in the manufacture of machinery. It is not very long ago that, for almost every large machine, we required help from England, and had the greater part from that country. Now an entire change has taken place in this respect, and the great establishment of this kind in Berlin furnishes the most complete and admirable machines at far lower prices than in England. These happy results we owe to the zeal of Privy Councillor Beuth, who, as President of the Mechanics' Institution, and Director of the Department of the Interior, does every thing to favor and improve the construction of machines. —[Frankfort paper.]

We subjoin an interesting account of the London and Greenwich Railway. The idea of a viaduct instead of embankment, or of the more old fashioned way of conforming as nearly as possible to the surface of the ground, is novel, and the plan of turning the arches into offices, houses, &c., droll; but the calculations in regard to the income to be derived from renting such offices, &c. is most extravagant. A house without a chimney, and with an everlasting rumbling of locomotives overhead, is not the most desirable location for a man of business or leisure.

From the London Mechanics' Magazine.

THE GREENWICH RAILWAY.—This Railway, it is well known, is to proceed from near the foot of London Bridge on a viaduct 22 feet high, supported by about 1000 arches, to Deptford and Greenwich. In so short a distance as 4 miles, great differences in the under soil were hardly to be expected. However, substrata of clay, gravel, sand, peat, bog, and floating land, seem to have presented themselves in luxuriant variety, the best soil often in juxta-position with the worst. But with these the engineer has successfully contended, so that it would require a professional eye to discover any effect of settlement out of 575 arches already built.* In general, the arches are segments of circles; but almost every species of arch in use, except the Gothic, is pressed into service as circumstances need. The eye is occasionally arrested by an arch commencing with the segment of a circle, and when looked through, presenting a parabola or part of an ellipse. Professional men well know the difficulties of such oblique structures, yet, as far as I could perceive, there was no deficiency of symmetry or regularity, while the transition of figures seized the mind with its pleasing effects.—The prevailing character of the work may be summed up in uniform neatness and strength without heaviness.

For the purpose of additional security, cross walls are built between the arches, over which the rails are to lie for the trains, and the intervals are filled with concrete.—By this means the mass is rendered one solid piece, and the weight of the carriages is spread over a large space.

It seems to be a favorite maxim with Colonel Landmann, the engineer, that wherever the lead is long, a viaduct is generally more economical than an embankment. Without implicitly subscribing to this doctrine, in which there is often more truth than some civil engineers are willing to admit, it is evident that embankment in the Greenwich Railway would have been little short of insanity. Putting out of the question the enormous expense of forming it where all the materials have to be raised to the embankment, not to be drawn out on a level, and of the additional ground to be purchased, both for the embankment and materials; setting, I repeat, all this aside, together with the immense rental which must ultimately result from nearly 1,000 manufactories, shops, houses, and warehouses, into which the arches are being converted, it is probable that long before such an embankment of 22 feet high could settle into a road fit for locomotive travelling, the Colonel's viaduct will be finished, and likely enough return a large portion of the capital expended.

At the Deptford end several of the arches are now occupied by the Company for smiths', carpenters', and other shops, which must obviously be a great saving to the concern. One or two of the arches are also tenanted as public houses. Over two made into two five-room private houses, I have been, and I must confess, contrary to my expectations, I found them comfortable, roomy, and compact. The inconvenience I anticipated in my former communication from smoke, is removed by the use of gas stoves, with which the houses are furnished. In the neighborhood of London many of these arches will doubtless be let for offices, vaults, and warehouses. I have heard that 500*l.* per annum have already been offered for some between Joiner-street, and the bridge terminus. At all events, it will be the managers' fault if ultimately they do not turn in a large re-

* Lest my friend Sir John Rennie should again hazard an expression that I am "unacquainted with the engineering details," I must here beg to observe, that a few of the piers on each side of the abutments supporting the elliptic arch over Earl's sewer, nod a little towards the sewer, from a circumstance of which it is unnecessary to go into the "engineering details," but I will if Sir John wishes it.

venue. It is said there will be about 1000 of them, which some calculate will fetch 30*l.* per annum each; or, on the whole, a rental of near 30,000*l.* per annum. But suppose only 900 of them let, and at 20*l.* each, the rental will be 18,000*l.* per annum, or 2,000*l.* annually more than the interest of the whole capital (400,000*l.*) at 4 per cent.; a tolerable argument that the engineer had here good reason for preferring his viaduct to a profitless embankment.

From the London Mechanics' Magazine.

ELECTRO-MAGNETIC MOVING POWER.

British Association.—Section of Mathematics and General Physics.—The Rev. Mr. M'Gauley exhibited the working model of a machine for producing moving power by the application of electro-magnetic influence. The model consisted of a pendulum, the lower part of which was a magnet placed with its poles opposite to the ends of two horse-shoe bars of soft iron, round which were coiled helices of wire so arranged that by the end of the helices dipping into cups of mercury the poles of a simple galvanic battery could be alternately made to communicate with the cups in one order, and the next instant the machine reversed that order by means of a system of bent wires, caused to vibrate upon an axis, the ends of these bent wires alternately dipping into one pair of cups, and the next vibration into another; by these means the soft iron horse-shoes are at one instant a magnet with the poles in one order, the pendulum being then attracted towards both these poles, but the next instant, the poles being reversed, the pendulum is thrown forcibly back, while the opposite soft iron horse-shoe is now a magnet ready to attract it; then again it is thrown back from this second temporary magnet by the instantaneous reversing of its poles, and so on. The model worked smoothly and with a very uniform regulated motion, and appeared to be capable of working for a great length of time. Mr. M'Gauley stated that the erosion of the zinc plate was so inconsiderable, that there was hardly any limit to the length of time that the model would continue working. The acid best suited to the purpose was a mixture of one part nitric acid, two parts sulphuric, and one hundred water; he also stated that the acid in practice could be always renewed by having a constant dropping of fresh acid liquor into the trough, while a similarly gentle discharge of the spent acid from the trough could be kept up. He stated, that a numerical comparison of the economy of this mode of producing motive power with that depending upon the agency of steam, would give a vast preponderance in favor of this method, while the part of the power consumed in working the machine itself might be left entirely out of account, since the apparatus which changed the poles in his model, would equally suffice in a machine capable of working with the power of one hundred horses. In his model he only worked one of the two soft iron magnets, and its power was only that of lifting seven pounds, and yet this appeared to be sufficient to overcome all the friction, inertia, and other impediments to motion, of the several parts of the machine.

The exhibition of this model was received with sincere and reiterated applause, and many scientific men present expressed sanguine expectations of the value of the method in a practical point of view, all agreeing that it was the best attempt yet made of the many schemes that had been proposed for producing motive power by the electro-magnet.

It is but an act of justice to state that the foregoing apparatus is in every respect similar to one described, some time ago, in Silliman's Journal, and being the invention of Professor Henry, of Princeton, N. J.—Prof. H., we understand, was the first to start an idea since frequently practised upon.

PROGRESS OF THE IRON RAILROAD SYSTEM IN GERMANY.—The road from Nuremberg to Furth will be opened this month; and from Dresden to Leipsick is in construction; that from Cologne to the Belgian frontier will probably be commenced immediately after the next meeting of the shareholders, which is fixed for the 25th instant. For those from Elberfeld to Roer, and from Elberfeld to Dusseldorf, subscriptions are opened. That from Minden to the Rhine is under consideration. Its importance, in a military point of view, leaves no doubt of its being shortly undertaken. It will unite the Weser with the Lippe, and will join the Rhine in two places (Dusseldorf and Deutz) opposite Cologne. That

from Berlin to Potsdam is decided upon, and will serve as a model for the other Railways in Germany. It will be laid by the best engineers of Berlin. For the Roads from Berlin to Leipsick, from Berlin to Magdebourg, and from Magdebourg to Leipsick, subscriptions of 14,844,400 francs have been received, and they will be encouraged by the Prussian government. The projected Railroad from Berlin to Stettin is favored by the hereditary Prince of Prussia. The following are under consideration:—From Hanover to the Elbe—from Bremen to Hanover—From Stuttgardt to Carmstadt—from Frankfort to Mentz—and from Mannheim to Basle. That from Neustadt, in Holstein, to Altona, has been decided upon by the Danish government. In Austria, two gigantic undertakings are in contemplation—a Road from Vienna to Lemberg, in Galicia, and another from Vienna to Trieste, in the Gulf of Venice. The first will have to run in a direct line, by the map, 100 Belgian leagues, of 20 to a degree, and the second, a distance of 60 leagues.—[Paris Advertiser.]

LOCOMOTIVE ENGINES.—We make the following extract from a letter dated Dec. 1, from a friend in Charleston, S. C., in order to show that improvements in Railroad Machinery is not confined to Baltimore, or any other one place, but wherever there is a Railroad, there also may be found improvements. It may well be asked, Who dared, *ten*, or even *five*, years ago, to predict that an Engine would be constructed, and *especially* in *this* country, capable of taking a load of 130 tons EIGHTY miles in a day, and that too up inclinations of 37 feet per mile?

In relation to the comparison made with the Baltimore Engines, the statement is too indefinite to form an opinion.

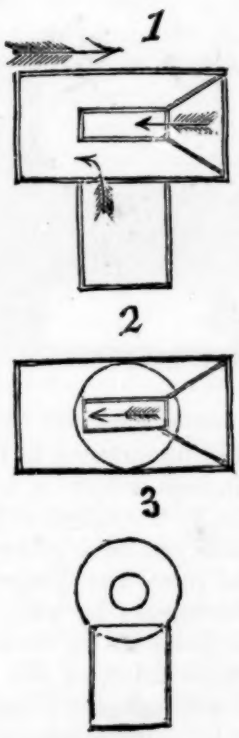
Charleston, S. C. Dec. 4, 1835.

To the Editor of the Railroad Journal:

Sir—I take the liberty of giving you an account of the performance of the improved Six Wheeled Locomotive Engines, now at work on the Charleston and Hamburg Railrord, built after the plans and drawings of E. K. Dod, Chief Engineer of said Road.—These Engines perform a trip from Charleston to Aiken and back in three days, the distance is 240 miles, carrying a train equal in weight to 130 tons—with this load they surmount all the ascents, some of which are on a grade of 37 feet to a mile. You will perceive that this is more than double what the Engines on the Baltimore and Ohio Railroad are doing according to the accounts in your Journal. These same Engines are capable of travelling with our ordinary passenger train at a speed of 40 miles per hour, although the Engines are limited to run but 20 miles per hour, unless they are behind the regular time. The cylinders are 10½ inches in diameter and 16 in stroke, driving wheels 54 in. diameter, the cylinders being secured on the outside of the boiler, enable us to dispense with the Cranked Axle.

[We shall be gratified to hear farther particulars from the writer of the above letter, in relation to the Charleston Railroad and its machinery.—[ED. R. R. J.]

EFFECTUAL CURE FOR SMOKY CHIMNEYS.



From the London Mechanics' Magazine.

Sir,—As the season of smokey chimneys is arrived, I send you for insertion a sketch and description of a very effective cowl that has, in every case hitherto tried, proved a complete remedy for that worst (but one) of all domestic nuisances.

Fig. 1 represents a section of the improved cowl, which is constructed as the common cowls are, so far as regards the general principle of the revolving of the lateral on the vertical parts of it; but in

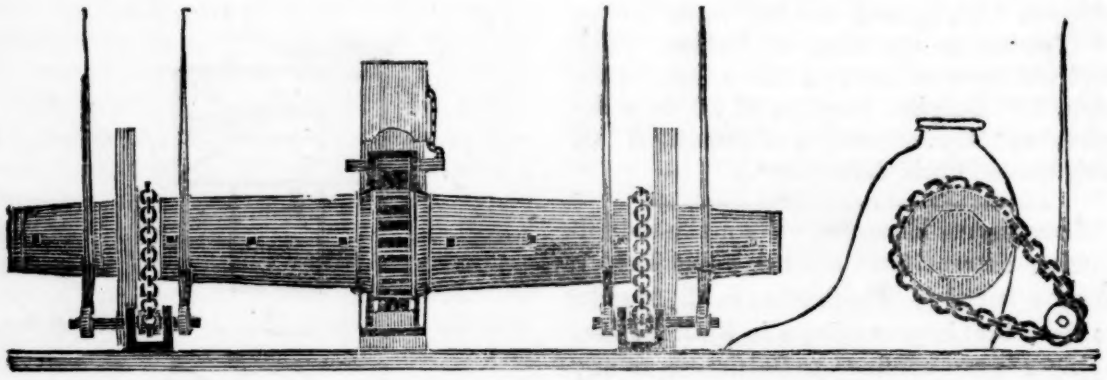
stead of the end opposed to windward being, as is usual, closed, a funnel-shaped apparatus is introduced, terminating in a pipe of about three inches diameter, which is carried just over the opening of the vertical chimney-pot. The effect of this is, that the lateral pipe of the cowl being, by the operation of the wind on the vane, always turned endwise in the direction of whatever current of wind may happen to be strongest at the time, a draught is created by the wind rushing through the funnel-end of the cowl-top, and the smoke is thereby, with considerable velocity, carried completely out of the cowl. The stronger the current the more effectual the apparatus.

This method of cure has been tried in several instances of heretofore incurable smokey chimneys, and has been entirely successful in every case. It is the production of an ingenious friend of mine, a clerk in the Tower, where a suite of rooms, which were formerly untenantable in consequence of the impossibility of using the fire-place, has been brought into useful employment, simply by the erection of one of those cowls on each of the flues.

I am, sir, yours, &c.,

Oct. 22, 1835. L. MUNDY.

YOUNG'S PATENT INCREASED PURCHASE FOR SHIPS' WINDLASSES.



From the London Mechanics' Magazine.

Sir,—Next in importance to the security of a ship's windlass, which is now so completely effected by the patent pall and riding chock, of which you have given place to a description in your last Magazine (page 41), are improvements by which a greater power can be given to its action, than by the common application of the handspike. For, however well adapted it may be, when the resistance to be overcome is much less than the power which can be so applied, it is a fact, well known to seafaring men, that there are times when the utmost exertions of the whole ship's company, by such means, are unequal to purchasing the anchor. And it still more frequently happens, that by their long repeated efforts, they are unable to advance the pall cylinder even one tooth in its revolution, that is, to bring in about two inches of the cable, until aided by some lucky wave or changed position of the vessel: consequently, in such cases, much time and strength are expended before a vessel can be got under way, merely for want of additional power. This has led to various mechanical contrivances, most of which have been modifications of the cog-wheel and pinion, but which have severally proved defective and unfit for the casualties to which they are exposed on ship-board, particularly from the changes which take place in the distances of the centres, by the straining of the windlass, bits, or timbers, whereon they may be fixed. Complicated machinery, however powerful, is decidedly objectionable. Indeed, any apparatus to be applied to a ship's windlass should be simple in its construction, direct in its action, compact, strong, and not liable to be deranged, and withal, not too expensive. That *Young's patent purchase*, of which I herewith send you a description, combines these properties, will be readily admitted by those of your readers who are particularly acquainted with the working of a ship's windlass, as

it is also by those who have adopted it in its present complete state.

Fig. 1, is a back elevation of a ship's windlass and bits, fitted with Sowerby's patent pall and riding-chock in the middle, and Young's patent purchase at each end within the garrick bits.

Fig. 2, shows a section of the windlass body, and an end view of the purchase and starboard garrick bits.

The patent purchase consists of a strong cast-iron wheel, firmly wedged upon the body, with semi-elliptci cavities in its surface, adapted to hold the sides of the link of a chain which embraces it, and a pinion with similar cavities in its surface. The pinion is keyed upon an iron axle, working in a carriage placed on the deck, and bolted down to a beam abaft the windlass. Ratchets are also keyed upon each end of the axle, and worked by a palling box, from which a socket arm is continued for receiving the handspike. The two ends of the chain are connected by a shackle made on the segment of a link, so that it also fits the cavities in the wheel and pinion. The chain may be tightened or slackened by means of adjusting wedges, which are fitted on the carriage. The drawings represent the handspikes in their places, which, on being depressed, bring the pinion round, and with it the windlass body, with a power proportioned to the size of the wheel to that of the pinion. The usual proprotions adopted are about four to one; consequently, one man using the purchase, is nearly equal to four men applied to the windlass in the usual way. Hence, with it, a small number of hands may get the anchor, when the whole ship's company would be unable to do so without it. In addition to its great power, it possesses other important advantages, a few of which I shall briefly enumerate as follows:—It is not liable to be injured by the heaving or pitching of the vessel in a heavy sea; the endless chain which embraces the two wheels fixed upon the windlass body and axle not being tight, but passing easily and loosely round them, added to the peculiar form of the wheels, renders them incapable of being thereby deranged or broken. The men can, with the same handspike, at pleasure, use the common windlass, or take advantage of the patent purchase, their faces being always towards the ship's bow. The handspike not requiring to be taken out (as they fleet themselves by the ratchets), no time is lost in re-inserting them, as with the common windlass alone. Should the cable ride, or a handspike foul, it allows the windlass to be turned backward. It is a considerable security to the windlass necks, as its pull is in an opposite direction to that of the anchor, and when riding, it answers as an extra riding-chock. It offers no obstruction to the free use of the windlass, having no spindle passing from bit to bit; no wheel projecting beyond the bits, and preventing the weather-bitting of the cable—no cog machinery to be deranged—whenever the windlass requires to be unshipped, the chain may be taken off in a few minutes. It may be fitted to one or both ends, or to the middle, even in a few hours, if necessary. It is admirably adapted to large vessels, as the chains may be carried to any convenient distance; and, if required, the speed of the windlass increased, by adopting a larger pinion. Its construction and action are so simple, as to render it unnecessary to encroach further upon your valuable pages, unless it be to say, that it is also the cheapest purchase which has hitherto been applied to a ship's windlass.

Yours respectfully,

T. SOWERBY.

Patent Windlass Works, near Shadwell Dock Basin, London, Oct. 21, 1835.

From the London Mechanics' Magazine.

ON RAILWAY PLATFORMS. BY JOSEPH JOPLING, ESQ., ARCHITECT.

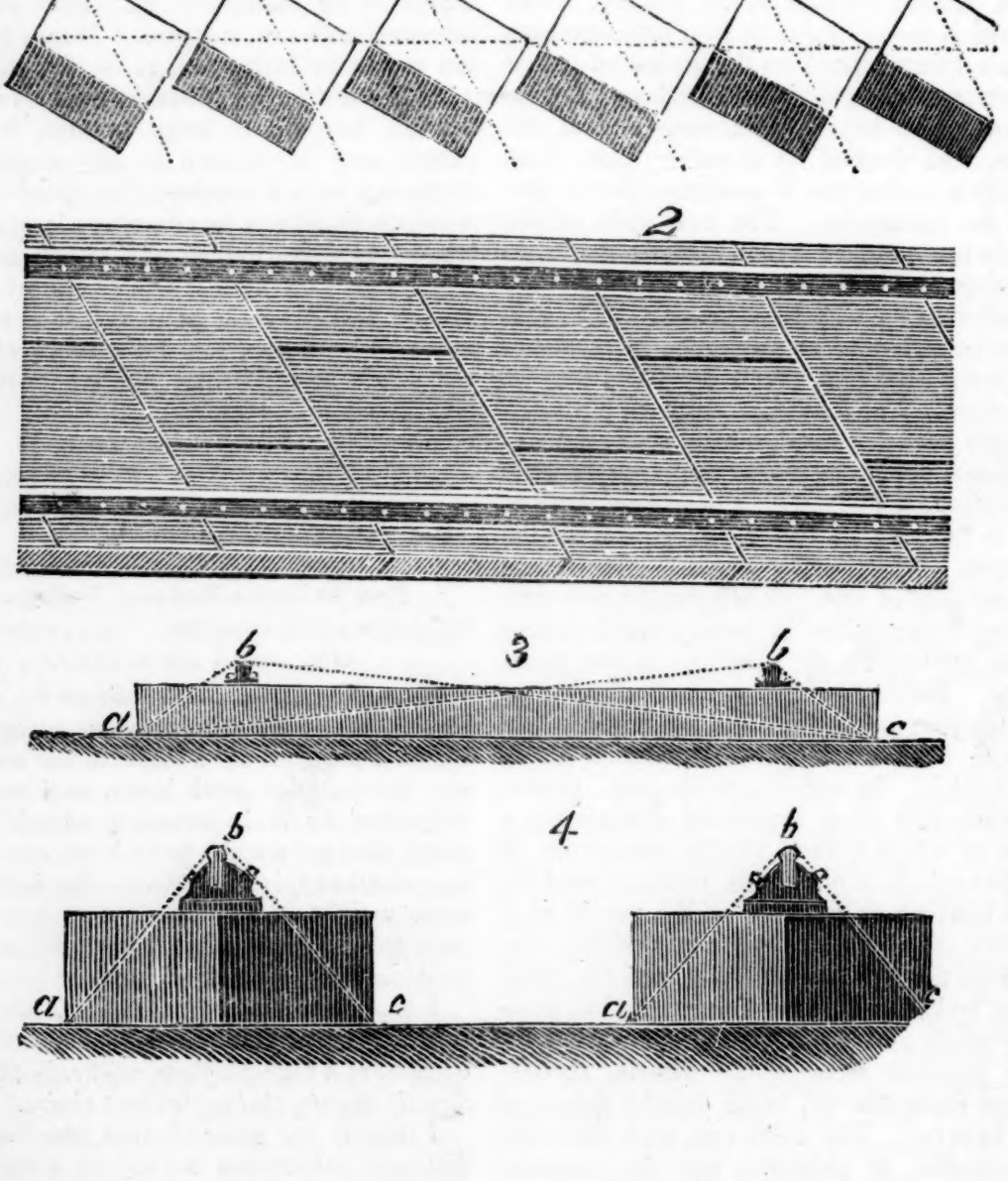
Sir,—Supposing the weight of the stone blocks, at the distance they are apart near Chalk Farm, to be sufficient for steadying the rails for such loads, and at such velocities as it is intended should pass along that railway, I have been considering whether it is possible to distribute the same weight in any other way more advantageously, and what description of material is best calculated for that purpose.

I have formed several plans, but venture first to submit to the consideration of engineers *a slate platform, with rails screwed directly thereto, that is, without chairs.*

I take it for granted that the less the distance is between the top of a rail and the foundation or bed on which the stone is laid to which it is to be affixed, the better, so that the rail be of sufficient

JOPLING'S IMPROVED RAILWAY PLATFORM.

Fig. 1.



strength and the stone be of sufficient thickness to hold firmly the fastenings for the rail.

Also, that the nearer the points for supporting a rail are to each other, the less the vibration will be.

Again, that if any rail be supported throughout its length, the vertical vibration of it will be the least possible.

And further, that the nearer the points for fixing a rail to its stone support are to each other, the less strain there will be upon each.

The difference between the method adopted for the London and Birmingham Railway and the one now submitted to your readers, will appear obvious by the accompanying figures and the following description:

Fig. 1 is an isometrical representation of the stone blocks as they are placed for the chairs to support the rails, near Chalk Farm. The distance between the centres of the blocks under each rail is 5 feet; and the distance from the centre of one block to the centre of the next under the same rail is 3 feet. The top and bed of each block is 2 feet square, and the depth 12 inches. Therefore, each block contains 4 cubical feet, and each has a bed of 4 superficial feet; and, consequently, there are 8 cubical feet of stone, having in every yard in the direction of the length of each railway 8 superficial feet of bed. A chair is fixed over the centre of each block, and the distance from the top of the rail to the bottom or bed of the block is 18 inches. This will appear more evident by the transverse section, fig. 4, showing two of the blocks, and the position of the tops of the rails. The dotted lines *a b c*, from the top of each rail to the angle of each block on its bed, shows the greatest angle of resistance they have to lateral vibration. If the blocks were not placed diagonally, the angle of resistance would be much less, but probably more correct. It is, indeed, considered to be doubtful whether any advantage is obtained by the diagonal position of the blocks.

Fig. 2 represents a platform of slate, nearly 5 inches thick, and 6 feet 6 inches wide, containing the same cubical quantity per yard as the stone blocks at Chalk Farm. Fig. 3 is a transverse section of the same, showing the top of each rail. The dotted lines *a b c* show the angle which the top of each rail makes with the lateral extremities of the bed of the slate platform. The angles *a b c*, in fig. 3, are much greater than the angles *a b c*, fig. 4; besides, the latter is considerably too much. Therefore, the platform, it is considered, would hold the rails much steadier than the blocks at Chalk Farm; the weight per yard of each being the same, and both being bedded in the same way.

Fig. 5 is the section of a rail proposed to be affixed directly to the slate platform, by means of bolts and copper or brass nuts introduced into the slate. If there are eight of these bolts in each yard, the points of fastening to the platform would be four times as many as those to the stone blocks, and the strain upon each, therefore, if the rail was not bedded, would only be $\frac{1}{4}$th; but as the rail is proposed to be bedded throughout on felt and a leather collar under the head of each bolt, any jar or vibration the rail might have, it is considered, would scarcely be perceptible. The inner side of the rail, and the face of the slate under it, to be made quite fair. At each end of each piece of rail is to be a mortice, the vertical section of which is shown by the lines *a b c d* on this figure.

Fig. 5.

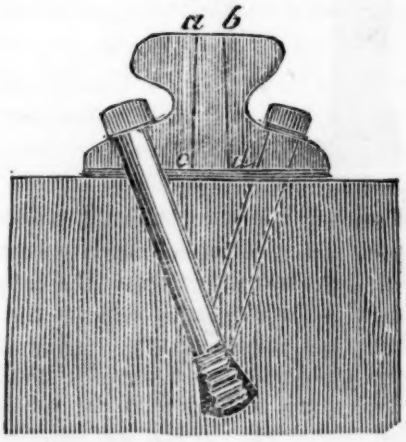


Fig. 6.

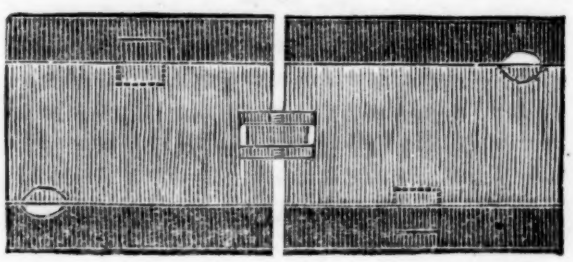


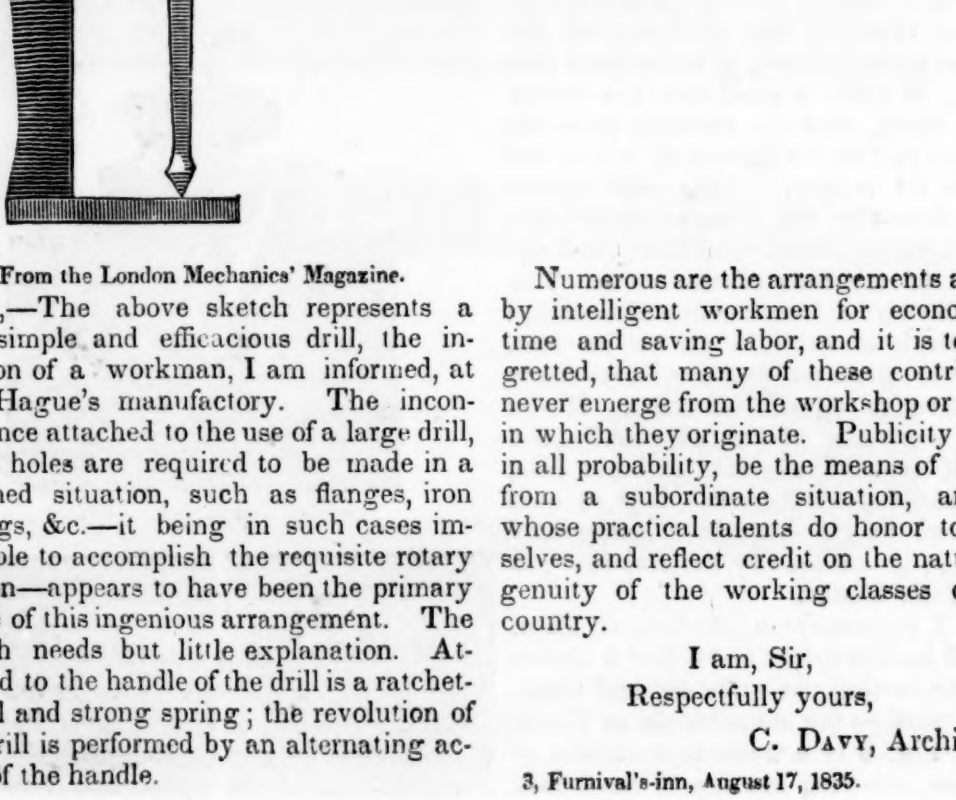
Fig. 6 shows the plan of this rail where two lengths meet, with the mortice in each, and the wedge which keeps them fair, which, as well as the elliptical holes for the bolts, allows for expansion and contraction. Two bolt heads are also shown.

This possibly may be sufficient for the present to draw attention to this subject; and I think I shall be able to show that slate material is applicable for this purpose, and may be advantageously used for Railways where there is great traffic, and where great speed is required.

I am Sir,
Your obedient servant,
JOSEPH JOPLING.

34 Somerset-street, Oct. 15, 1835.

SIMPLE DRILL.



From the London Mechanics' Magazine.

Sir,—The above sketch represents a very simple and efficacious drill, the invention of a workman, I am informed, at Mr. Hague's manufactory. The inconvenience attached to the use of a large drill, when holes are required to be made in a confined situation, such as flanges, iron railings, &c.—it being in such cases impossible to accomplish the requisite rotary motion—appears to have been the primary cause of this ingenious arrangement. The sketch needs but little explanation. Attached to the handle of the drill is a ratchet-wheel and strong spring; the revolution of the drill is performed by an alternating action of the handle.

Numerous are the arrangements adopted by intelligent workmen for economising time and saving labor, and it is to be regretted, that many of these contrivances never emerge from the workshop or factory in which they originate. Publicity would, in all probability, be the means of raising from a subordinate situation, artificers whose practical talents do honor to themselves, and reflect credit on the natural ingenuity of the working classes of this country.

I am, Sir,
Respectfully yours,
C. DAVY, Architect.

3, Furnival's-inn, August 17, 1835.

For the Mechanics' Magazine.

Observations on Mr. Goodyear's New Method of Working Caoutchouc.

By L. D. Gale, M. D., Professor of Nineralogy and Geology, in the New-York University, and Professor of Chemistry in the New-York College of Pharmacy.

The article called *Caoutchouc*, or *Indian Rubber*, has been known and used, but more especially in Europe, since 1770 or 1780. It does not appear when the first specimens were imported thither, but it was familiarly known and used in France in the composition of certain varnishes as early as 1783.

The now extensive importations, domestic uses and manufacture of the article in this country, are said to have originated from the following fact. In 1820 or '22 an American sailor brought with him from Para, a port in Brazil, to Boston, a few pairs of India Rubber shoes, which he offered for sale. The idea of obtaining shoes perfectly water-proof soon brought an abundance of customers, and the articles were sold at a very great price, which circumstance induced others to enter into the business, until the importations, uses and applications, had reached their present enormous extent, some faint idea of which may be had from the fact that there are numerous companies for the manufacture of this article now established in various parts of the United States, with capitals of from fifty to two hundred thousand dollars each. As its uses began to multiply, it became a desideratum to find good and cheap solvents for it; accordingly the various liquids have in turn been subjected to examination, for ascertaining their solvent powers. Spirits of turpentine being a good and cheap solvent, many methods have been proposed for purifying it in such a way as to render it drying, it having been erroneously supposed that this effect was produced by the impurity of the solvent used.

Though manufacturers have met with comparatively little difficulty in dissolving the rubber, they have not been so fortunate in drying it, and have completely failed in preserving its original elasticity.

The difficulty in drying the rubber arises from the fact that the whole substane is filled with the solvent, and that the only way for its escape is in the form of vapor, to which the rubber offers great resistance, being, to a certain degree, impermeable to the passage of either liquids or vapors.

Mr. Charles Goodyear, of New-Haven, has succeeded in discovering a method of manufacture which seems to remove all the above difficulties, and inasmuch as he has secured his plan by patent, he gives me liberty to make such use of it as I may think proper.

Mr. G.'s process, from specimens which I have witnessed at different times, together with the samples exhibited at the recent fair of the Mechanics' Institute, is so perfectly successful that he has apparently left little to be done in the way of improvement by his successors. The following is an extract from the report of the Premium Committee of the Institute, awarding to Mr. G. a silver medal for his useful discovery:

"The Committee are of opinion, that of all the useful modifications and applications of this article, (rubber,) none exceeds in novelty or utilty, that discovered by Mr. Goodyear. The original color, by a process entirely his own, is removed from the material, and any other given to it; whilst, at the same time, it is deprived of all its aqueous or unctuous qualities, and yet retains its elasticity, durability and imperviousness. The Committee can have no doubt of the utility and success of this discovery, and therefore recommend it to the immediate attention of the public."

The substance of Mr. Goodyear's improved process consists in dissolving the rubber in common spirits of turpentine, and adding carbonate of magnesia to the solution, drying it in a warm dark room 12 to 24 hours, and finally boiling it in strong lime-water. The following is Mr. G.'s recipe communicated to the writer:

"Dissolve 1 lb. India Rubber in 2 quarts of spirits of turpentine, and the spirits requires no purifying—the commercial article being sufficiently good for the purpose. Triturate 5, 6, 7, or 8 ounces of car-

bonate of magnesia (varying the proportions as you wish to vary the texture,) wet with water and mix it intimately with the gum.

"Spread the mixture thus made upon cloth, paper, or any other texture, and allow it to dry in a warm room or place not exposed to the sun, for 12 or 24 hours. The process is completed by boiling in water thick with cream or lime, and the longer the boiling is continued, the more perfect the article."

The discoverer does not mention the longest time which he has continued the boiling, but from some recent experiments of my own, in repeating the above process, the boiling was continued three hours, and in one instance, five hours; the result was, as anticipated, in both cases, quite satisfactory.

From the London Repertory of Patent Inventions.

SPECIFICATION OF THE PATENT GRANTED OT SAMUEL GARNER, OF LOMBARD STREET, IN THE CITY OF LONDON, GENTLEMAN, FOR AN IMPROVEMENT IN THE ART OF MULTIPLYING CERTAIN DRAWINGS AND ENGRAVINGS OR IMPRESSIONS.—Sealed Nov. 15, 1834.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said Samuel Garner, do hereby declare that the nature of the said invention consists in the formation, preparation, and treatment of plates of zinc, in such a way as fits them more perfectly than has been done by methods previously employed, for the same purposes for which the slabs of stone are used, as instruments for the multiplication of copies of writings, plans, or designs, in the art of lithography. For the purposes of the art which may be called Zincography, preference is given to metal of the purest quality. The metal is to be cast in suitable moulds into plates of uniform thickness and of requisite dimensions, either of the size for use, or calculated for extension under the rollers. When it is deemed desirable, as in the generality of cases, I consider it advisable, in order to give to the metal greater density than it possesses in its simply cast form, the plates are to be subjected to the pressure of a pair of metal rollers, passing them through at a temperature at which the metal is malleable, alternately in the direction of the length and breadth of the two superficial dimensions of the plates, in order to prevent the metal from taking a fibrous texture, as it does in some degree, when repeatedly rolled in only one direction. The action of the rollers thus managed, produces a more uniform condensation of the metal than can be effected by planishing with the hammer. The cast plates, whether subsequently laminated or not, are to be brought to accurate uniformity of thickness by being planed on one or both of their faces by a planing-engine, such as is now commonly used for planing the surfaces of other metals. By these means an accurately flat working face is obtained, which conduces essentially to the more certain and uniform action of the press in the operation of working off the imppressions. To render the surface of the metal better adapted to receive the marks or lines intended to be multiplied by impression therefrom, it is advisable to impart to it a certain roughness, termed, technically, a grain: this is effected by rubbing the surface to be grained with some cutting substance in a pulverulent form, and as silicious sands, emery, stone, or marble-dust, pounded pumice, rotten-stone, charcoal-powder, or other such materials, having the requisite property of abrading the metal; some such substances may be used for the purpose in masses or lumps, as pumice-stone, charcoal, &c. These materials may be employed with water, or other non-solvent liquid, being rubbed upon the metal surface in all directions, until an uniformity of grain is produced. Either two plates may be used to grind each other, or a muller may be employed, or leather, or other soft substance, may be the instrument for the application of the cutting-powder to the metal. The fineness or coarseness of the grain to be produced will of course regulate the fineness or coarseness of the grinding material to be used; but in all cases it must be guarded against applying matters of such coarseness as will cut deeply into the plate, it being the object to produce a roughness of surface of regular grain. Sometimes, perhaps, it may be useful to give a different grain to different parts of the same plate, with the view to accomdate the artist in assisting to impart a variety of character to his work; this can be

done by using the grinding materials of different qualities in different parts of the plate, conducting the operation by hand, with such partial applications as may be indicated. The grinding completed, the material must be washed off, and the plate may be cleansed from impurities, to prepare it for the reception of the writing or design, by washing with a solution of alkali, either potass or soda, caustic or sub-carbonated. The lines or traces to be multiplied from the zinc plate are made thereon by similar materials and preparations to those used for the like purpose in the art of lithography. This being done, either by hand or by transfer, they are to be fixed and prepared for the subsequent operations by brushing over the face of the plate an acidulous liquor, such as the one which may be prepared in the following manner:—Boil in a pint of water about one ounce and a quarter of bruised gall-nuts until the fluid is reduced one-third; pass the decoction when cool, through a seive or fine linen strainer, to separate the clear liquor; to which add about two fluiddrachms of nitric acid, and three or four drops of muriatic acid. This formula may be varied as to the proportions of the acids, according to the nature or strength of the work to be fixed; a weaker acid for the more delicate work. The acidulous liquor may be brushed over the work with the tool ordinarily employed for such purposes, and it may be left to act thereon, and on the metal for a longer or shorter time, according to the strength of the lines, or work to be fixed, a few minutes will commonly suffice, but no injury appears to result from a longer time. The plate should then be washed with clean water to free it from the acid, and then the work may be covered with gummed water, and is done on stone. Other acidulous liquors than the one above described may be made use of for fixing the work upon the plate, such as any diluted acid, the action of which on the metal will be moderate; or solutions of many of the super-acid salts; for example, muriate, or nitro-muriate of tin; but for general purposes I prefer the preparation above described, and claim to use, where convenient, or indicated for special purposes, any other form or preparation of acidulated liquor. The zinc plates prepared and treated in the way herein described, answer for the reception and redelivery, by impression, of all the different kinds of work now usually executed by means of stone in the art of lithography, and equalling the stone in all the properties dependant on surface; the zinc plates have the great superiority of being able to bear the action of other kinds of presses than those which have been especially adapted to the working off impressions from stone. The copper-plate roller-press, the ordinary type press, and others giving adequate pressure over the whole surface of the plate, may be employed with due effect in pulling impressions from the zinc plates. In the processes herein described for the formation, preparation and treatment of plates of zinc, to fit them more effectually than they have heretofore been found, for the purpose of multiplying copies by printing of lines, traces, or markings, made by certain materials upon their surfaces, consecutively used as now indicated, either to the whole extent or partially, by the omission of one or more of the processes; for instance, condensation of the metal between rollers, or modified, as by change of material, to produce certain effects, for instance, graining and fixing the lines or design upon the metal, consists the invention for which I have obtained the grant of the herein partially recited letters patent. And such invention being, to the best of my knowledge and belief, entirely new and never before used within that part of His said Majesty's United Kingdom of Great Britain and Ireland called England, his said dominion of Wales, or Town of Burwick-upon-Tweed; I do hereby declare this to be my specification of the same; and I do verily believe that this my said specification doth comply in all respects, fully and without reserve or disguise, with the proviso in the said hereinbefore in part recited letters patent contained; wherefore I do hereby claim to maintain exclusive right and privilege to the said invention.—In witness whereof, &c.

Enrolled May 15, 1835.

SAUNDERS' PATENT FOR CHILLING THE INTERIOR FACINGS OF IRON CASTINGS.

To all to whom these presents shall come:

Be it known, that I, William Henry Saunders, of Dobbs' Ferry, in the township of Greensburgh, in the county of Westchester and State of New-York, patent axle

manufacturer, have invented a new and useful improvement in the manufacture of the cylindrical interior faces of iron castings by a new method of chilling the same, and that the following contains a full and exact description thereof.

The method commonly used in making iron castings with cylindrical interior faces, as pipes, steam cylinders, boxes for axles, &c., is to form what is technically called a core of loam or sand, which, by dampness and pressure or other means, is caused to adhere together in the form of a solid cylinder, which is inserted into the mould, and upon this core the melted iron is run or cast. After the casting is made, the sand or loam core is taken out of the interior of the casting and leaves a cylindrical vacancy in the space previously occupied by the cylinder of loam or sand. The castings so made, are in general equally soft on the interior and exterior faces, but in many cases, as in cylinders for locomotion and other steam engines, boxes for axles, eyes of sheaves, pulleys, and wheels which run loose on their shafts, &c., it is desirable that the cylindrical interior face of the iron castings should be as hard as possible. In castings with conical interior faces, as boxes for taper axles, this desirable hardness is produced by running the melted iron upon a conical turned solid iron pin, which is used instead of the sand core before mentioned, whereby the melted metal is condensed at the instant of its contact with the surface of the iron pin, and the conical interior face of the casting thereby becomes extremely hard; the pin is afterwards forced out of the casting, and the result is the very hard conical vacancy in the castings which was required.

This method of chilling the interior faces of castings cannot be applied where such interiors are required to be perfectly cylindrical, because the melted iron, while cooling, contracts upon the solid cylindrical iron pin, and retains it so forcibly that it cannot afterwards be withdrawn; and this practical difficulty has hitherto been found insurmountable in castings with cylindrical interiors, although it is in some measure obviated in castings with conical interiors.

My method of overcoming the difficulty hitherto found in chilling castings with cylindrical interiors, will be fully understood by the following description and accompanying drawings. Instead of using a solid iron pin for the core of the casting, I use a pin composed of two, three, or more parts, which parts are connected together by a collar at each end, and wedged firm in the said collars by two conical plugs, one of which is inserted into each end of the pin so composed, whereby the ends of the two, three, or more sides of which the pin is composed, are pressed against the inner circumference of the said collar, and so retained in their places; the angular or flat faces of the said sides of the pin are also, by the insertion of these plugs, firmly held at a small distance from each other, so as to allow the plates or sides of the pin to fall together when the plugs are withdrawn, and thus leave the castings which has been run upon them.

What I claim as my own invention, and as not previously known, the above described improvement in the manufacture of iron castings with cylindrical interior faces, is not the making of such castings with sand or loam cores, or chilling the same upon solid, conical or cylindrical iron or other pins, but the chilling of such castings upon pins divided longitudinally and composed of two or more parts, by which contrivance, as well as by the use of the collars and plugs, (or by other methods which are obvious,) for retaining the parts of the pin at a small distance from each other, I am enabled to withdraw the said pins in parts from the said castings after they are cooled upon the pins, this withdrawal of the pin having been found impracticable in making iron castings with cylindrical interior faces, when cast upon solid pins.

I do not mean to limit my clain to the particnlar form of pin shown in the drawings, or to the improvement of boxes for axles alone, having chosen such forms only as exemplifications of the principle of my improvement, but I claim as included under my improvement all iron castings, of whatever form, size or kind, having cylindrical interior faces, and which shall be chilled upon iron or other metal pins composed of two or more parts and divided longitudinally.

W. H. Saunders.

Witnesses, { William Wood, Thomas Lindley,

We have seen a specimen of the above casting, in which the desired end appears to be fully answered. The patent is an ingenious one, fully and accurately described. —[Ed. M. M.]

Something New under the Sun—yet by no means, as we believe, impracticable. We copy the following notice of an effort to sleighride by *steam*, from the Galena Advertiser. It is the first attempt within our knowledge to apply steam power to sleighs :—

Steam Sleigh.—A couple of enterprising gentlemen by the names of I. D. Corson and Jonathan Haines, have lately been making some experiments with steam power in this place; applying it to a sleigh, which they had constructed for the purpose of running between this, Dubuque, Prairie du Chien, &c. They had it all in readiness, and on the first of this month, a trial of the invention was made, but owing to the inadequacy of the power of the engine, it did not come up to the expectations of the assembled spectators. There is one thing, however, certain, that had the engine been of sufficient power, it would have resulted in the complete success of this novel method of navigating the river in the winter.

The advantages to be derived from th's invention, could it be successfully carried into effect, are very obvious. Its speed would by far surpass any other mode of conveyance, which is one great object to be attained in travelling, and the expense of conveyance would be greatly lessened. The river also has the advantage of a Railroad, because the ice, being once formed, and strong enough to bear teams, needs not the aid of repairs, and forms one of the most perfect levels imaginable. There is not much if any more risk in this mode of travelling than in any other, as the sleigh can be made large and strong, and water-tight, to make it perfectly safe. In case of breaking through the ice, or running into air-holes, it can be immediately extricated by the means of a rope with a hook at one end, forced into the ice and drawn out by the power of the engine attached to the sleigh.

The sleigh is not only water-tight, but, by having seats, windows, doors, and stoves, it will be equally as comfortable as the cabin of a steamboat. By being protected from the inclemencies of the winter season, the steam sleigh will be far preferable to coaches, ordinary sleighs, &c. The traveller will not only be comfortable while travelling, but the anticipation of a journey will be cheering, and partake more of the character of a recreation than a dread, as in the ordinary method of travelling at this season.

As the steam sleigh will go into operation upon those waters in which steamboats ply, it will constitute a continual facility of transportation, in connexion with those boats, and in a few years, very probably, the utility of the steam sleigh must be acknowledged quite as indispensable to the commercial world as steamboats or Railroad cars.

The gentlemen, having secured a patent for their invention, will next season try their luck again, with the confidence, which the slight experiment has already afforded, of perfecting their invention to the satisfaction of the most doubtful. We certainly wish them all the success which the importance of their invention demands, and hope next winter to be one of the many witnesses of the success and utility of the experiment.

From the United Service Journal.

RECOLLECTIONS OF MY FRIGATE, "OR THE TRIUMPH OF STEAM."

FROM THE LAMENTATIONS OF JEREMIAH.

My gallant little hooker—my pride—my heart's delight,
We've weather'd many a gale of wind—we've fought in many a fight:
No craft upon the ocean e'er behav'd so very well,
As when we topp'd the mountain sea, or climb'd the rolling swell.

Firm he arts of oak were all her crew—her officers were brave;
Her timbers stout—her bows well form'd to breast the dashing wave;
Her sticks were staunch—her sails well bent—her shrouds taut as a bar;
Proudly she rode—"the beautiful"—ready for peace or war.

But ah! the man-of-war's man is not what he used to be;
For stopping half his quart of grog don't suit him to a T;
And though he gets more cocoa, and additional burgoo,
Jack sorrows for his absent Jill, and swears "till all is blue."

The good old days of wad to shot are pass'd off like a dream;
The thick dark smoke of broadsides is exchang'd for sca ding steam;
And now, alas! both ships and men when put upon their mettle,
Must start on end from the same cause—hot water in a kettle.

I've often heard the rushing winds piping amongst the gear,
Until we grew, like brothers tried, and I had lost all fear:
'Twas joy to hear its blustering voice give notice of the weather;
Ah, then we've join'd in harmony, and whistled both together.

But soon there'll be no gear aloft—the day of sails is past;
For ships, like coaches, go on wheels, with a chimney for a mast.
The towering canvass all is gone—even the heaven POKER
Is chang'd for one of hotter berth, and HANDED by a stroker.

The RAKING masts were once the pride of every boatswain's mate;
Yet soon they'll know no RAKING, but the raking in the grate:
To rake a craft, right fore and aft, was once their heart's desire;
Instead of firing with a rake, ah, now they rake the fire.

We used to hoist our colors at the peak-end of the gaff;
But like an idle ensign, now 'tis plac'd upon the staff;
On watch I've took my trick at wheel, to steer well I had learn'd;
Ah, me! like tricking watches, now the wheels are engine-turn'd.

I little dream'd when yet a boy—some sixty years ago,
That I should live to see the breeze sustain so great a blow!
Within six points we went close haul'd, but now a ship can fly
Ten knots, and poke her figure-head right slap in the wind's eye.

Yet still my gallant hooker—my pride—my heart's delight;
I'll think of you on many a day, and dream of you at night;
I have your picture on my wall—your model in my room;
And when I die, I hope they'll place them both above my tomb.

JEREMIAH JEWELBLOCK.

Royal Naval Hospital, Greenwich.

EXTRAORDINARY FACT.—The most extraordiary and the best attested instance of enthusiasm, existing in conjunction with perseverance, is related of the founder of the Foley family. This man, who was a fiddler, living near Stourbridge, was often witness of the immense labor and loss of time caused by dividing the rods of iron necessary in the process of making nails. The discovery of the process called splitting, in works called splitting mills, was first made in Sweden, and the consequences of this advance in art were most disastrous to the manufacturers of iron about Stourbridge. Foley, the fiddler, was shortly missed from his accustomed rounds, and was not again seen for many years. He had mentally resolved to ascertain by what means the process of splitting bars of iron was accomplished; and, without communicating his intention to a single human being, he proceeded to Hull, and thence, without funds, worked his passage to the Swedish iron port. Arrived in Sweden, he begged and fiddled his way to the iron foundries, where, after a long time, he became an universal favorite with the workmen; and, from the apparent entire absence of intelligence or any thing like ultimate object, he was received into the works, to every part of which he had access. He took the advantage thus offered, and having stored his memory with observations and all the combinations, he disappeared from amongst his kind friends as he had appeared, no one knew whence or whither. On his return to England he communicated his voyage and its results to Mr. Knight and another person in the neighborhood, with whom he was associated, and by whom the necessary buildings were erected, and machinery provided. When at length every thing was prepared, it was found that the machinery would not act; at all events it did not answer the sole end of its erection—it would not split the bar of iron. Foley disappeared again, and it was concluded that shame and mortification at its failure had driven him away for ever. Not so; again, though somewhat more speedily, he found his way to the Swedish iron works, where he was received most joyfully, and, to make sure of their fiddler, he was lodged in the splitting mill itself. Here was the very aim and end of his life attained beyond his utmost hope. He examined the works, and very soon discovered the cause of its failure. He now made drawings, or rude tracings; and having abided an ample time to verify his observations, and to impress them clearly and vividly on his mind, he made his way to the port, and once more returned to England. This time he was completely successful, and by the results of his experience enriched himself and greatly benefited his countrymen. This I hold to be the most extraordinary instance of credible devotion in modern times.—[Letters, Conversations, and Recollections of S. T. Coleridge, Esq.]

STEAMBOATS.—By a communication in a late number of the Pittsburg Gazette, we learn that at that place, during the last year, 46 new steamboats have been built, with an aggregate tonnage of 8,200. This, we believe, is a larger amount than has been built by any other city of the Union in the same time.

STEAM-ENGINE WORK.—A steam-engine, lately erected on a copper-mine in this neighborhood, (St. Austell,) has been reported to have raised, at an average rate of performanee, upwards of ninety millions of pounds weight one foot high, with a bushel of coals. The correctness of this statement was questioned by rival engineers and others, and so seriously, that a challenge for a public trial was given and accepted. It took place last week, in presence of a number of most experienced mine agents from different parts of the country, and the result of twenty-four hours' trial was the unprecedented performance of lifting 125½ millions of pounds weight one foot high, with every bushel of coals consumed! The engine is of large size, the cylinder being 80 inches diameter. The principle is that of Boulton and Watt, but improved in economising the heat when generated, so as in the greatest possible degree to apply it to the end of producing steam, and maintaining it until its work is performed. The engineer's name is West.—[Falmouth Packet.]

SALISBURY PLAIN.—At a meeting of the Architectural Society, held last week, the President stated that on the recent inspection of the stones on Salisbury Plain, he discovered that the larger ones were of pure white foreign marble, regularly wrought into primate blocks; the discoloration was only superficial, produced, like the irregularities of shape, by the weather, and the granular character within was closely analogous to that of Carrara, obviously not Penthelic. This opens a wide field of conjecture respecting the means by which they arrived at their destination. Mr. Clarke is of opinion that they might have been brought by the Phœnicians from the shores of Greece, and introduced into this country by Southampton-water, from the upper navigable point of which there only remained a distance of 23 or 24 miles of land carriage to be overcome in conveying them to their present position. The expense and labor undergone to obtain stones of a white aspect for the great Druidical circle, tends greatly to strengthen the hypothesis that the arrangement was connected with the worship of the moon, in which such a respondent combination of altars might he conceived to be peculiarly appropriate.—[London Mechanics' Magazine.]

DUBLIN AND KINGSTOWN RAILWAY.—In eleven months and one week since the opening of this railway, the number of passengers has amounted to one million!

METEOROLOGICAL RECORD,

For the month of August, 1835, kept at Avoylle Ferry, Red River, La., (Lat. 31° 10′ N., Long. 91° 59′ W., nearly,) by P. G. VOORHIES.

AUGUST.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	REMARKS.
1	74	88	84	calm	clear	wind in the after'n S. E
2	75	81	79	..	cloudy	and showers all day
3	75	80	77	..	..	rain at noon and evening
4	71	85	82	..	..	clear at noon
5	75	80	78	..	clear	thunder and rain—wind N. W. at noon
6	74	84	80	..	cloudy	clear at noon—thunder—wind S. W. in the ev'ng
7	74	83	80	NW	clear	foggy morning and cloudy evening
8	72	80	74	calm	cloudy	light showers
9	72	82	78	..	..	rain in the evening—heavy and thunder
10	74	80	76	..	..	at noon a gale from W., and heavy rain and th'r
11	72	85	82	..	clear	
12	71	82	80	S	cloudy	rain
13	74	88	82	SW	clear	light showers at noon—cloudy evening
14	76	86	81	calm	cloudy	heavy rain in the morn'g
15	78	87	84	S	clear	Red river falling
16	78	89	84	calm	..	
17	73	87	85	..	..	
18	76	88	82	W	..	cloudy evening
19	75	88	83	calm	..	all day
20	76	89	75	..	..	heavy thunder storm and rain from N. W.
21	74	82	78	..	cloudy	
22	70	81	79	..	clear	
23	72	82	75	..	cloudy	rain in ev'ng—wind S. W.
24	74	82	77	..	..	close and sultry morning—at noon wind S.
25	74	84	75	S	..	thunder and rain in the evening—wind N. W.
26	72	80	72	calm	..	at 11 o'clock A. M. a severe gale from N. W.
27	67	68	72	W	..	rain, with heavy thunder and rain
28	71	78	77	calm	..	Red river on a stand
29	70	82	80	..	clear	
30	71	84	82	..	..	light showers in the ev'g
31	72	84	72	..	cloudy	rain and storm from the W. in the evening

Red river fell this month 1 foot 9 inches—below high water mark, 7 feet 9 inches.

We were present at an experimental trial at the Hereford Foundry, of a double-cylinder grinding-mill, of a construction entirely new to this part of the kingdom. The mill is intended for crushing fruit, bones, &c., is of great power, and very simple in its principle. The propelling power is steam, but horse power may easily be applied. Should the enterprising proprietor, Captain Radford, succeed in perfecting the machine, the economy which it will effect in horse and manual labor, will render the mill a most valuable agent on every farm.—[Hereford Times.]

METEOROLOGICAL RECORD,

For the month of Septem'ber, 1835, kept at Avoylle Ferry, Red River, La., (Lat. 31° 10′ N., Long. 91° 59′ W., nearly,) by P. G. VOORHIES.

SEPTEMBER.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	REMARKS.
1	70	76	75	calm	cloudy	clear in the morning
2	67	80	76	..	..	thunder and rain—high wind from E.
3	73	84	76	..	..	clear in the evening
4	71	86	79	..	clear	wind in the ev'g from S.E.
5	71	85	82	..	..	Red river rising
6	72	86	83	..	..	
7	76	78	75	..	cloudy	
8	70	74	72	..	..	
9	68	81	79	..	clear	
10	71	81	77	NE	..	cloudy evening
11	69	81	76	calm	..	
12	66	81	78	W	..	
13	66	82	79	calm	..	
14	67	82	78	..	..	
15	68	82	76	..	..	
16	67	82	74	..	..	heavy showers, rain and wind from E. in even'g
17	72	76	72	E	cloudy	all day
18	68	74	72	NW	clear	cloudy in the evening
19	70	76	69	W	..	
20	61	80	75	NW	..	
21	60	79	75	calm	..	
22	64	78	75	..	..	foggy in the morning
23	64	77	71	NE	..	
24	60	73	70	NW	..	
25	58	71	65	N	..	
26	54	72	66	NE	..	
27	56	70	64	NW	..	
28	58	75	71	calm	..	
29	62	79	75	..	..	
30	62	81	76	..	..	

Red river rose this month 7 feet 3½ inches—below high water mark, 5½ inches.

METEOROLOGICAL RECORD,

For the month of October, 1835, kept at Avoylle Ferry, Red River, La., (Lat. 31° 10′ N., Long. 91° 59′ W., nearly,) by P. G. VOORHIES.

OCTOBER.

Days.	Morn.	Noon.	Night.	Wind.	Weather.	REMARKS.
1	65	82	76	calm	clear	
2	70	82	73	..	cloudy	light showers in m'ng and thunder in ev'ng
3	60	80	72	..	clear	
4	66	75	66	SE	cloudy	light showers in the morning—ev'ng heavy thunder and rain
5	62	64	64	NE	..	
6	61	68	59	calm	clear	
7	48	72	61	..	..	Red river on a stand
8	48	70	60	..	..	Red river rose this month 5 inches—below high water ¼ in.
9	46	65	60	..	..	
10	47	70	61	..	..	Red river falling
11	48	71	64	..	..	
12	47	72	66	..	..	
13	51	75	68	..	..	
14	53	75	67	SE	..	
15	58	73	71	E	..	cloudy in the morning, and a little rain
16	72	78	72	SE	cloudy	heavy showers rain m'ng, and high wind
17	75	72	69	S	..	thunder and heavy rain all day
18	60	64	61	W	clear	at noon heavy rain and th'r, and all night
19	57	62	63	calm	..	wild geese flying to the south
20	62	71	62	..	..	
21	66	77	74	..	cloudy	foggy morning
22	68	77	73	SE	clear	.. .. cloudy ev'g
23	68	78	75	calm	..	
24	67	76	75	..	cloudy	all day
25	63	76	72	..	clear	
26	59	77	62	..	..	
27	58	78	64	..	..	
28	56	76	65	..	..	
29	64	79	72	..	..	
30	63	77	72	..	..	cloudyevening—rain all night
31	53	55	52	N	cloudy	

Red river fell this month 2 feet 11 inches—below high water mark, 3 feet 4½ inches. On the 7th Red river had rose this month 5 inches, and was then ¼ in. below high water mark.

To Purify Foul Casks.—First wash the inside of the barrel with cold water till it is perfectly clean. Then for an eighteen-gallon cask mix two gallons of cold water with half a pint of chloride of lime, which may be purchased for two pence, which pour into the barrel, and shake it about for about a quarter of an hour, then turn it out, and again wash the cask with pure cold water. A strong smell of lime will arise for some time, but in two or three hours it will leave it entirely. No fear need be entertained that any taste or smell of lime will be given to the ale.

Flax Spinning.—A letter from Lille says—"A great establishment is now erecting in this city. It is intended for spinning flax by machinery. Thus the great problem is solved, for which the Emperor Napoleon offered a reward of a million of francs, and we shall now enter into competition with the English, who eagerly buy up all the flax of our country."—[Brussels paper.]

Geological Discoveries in Maine.—We have seen specimens of four different kinds of marble, together with several specimens of silver, lead, copper, and iron ores, lately discovered in Maine, and now exhibiting at the Mechanics' Exchange in this city. We understand that a company with a capital of $600,000 has already been formed, with a view to the immediate mining of these several quarries and beds. Our builders now have an opportunity of getting some of this beautiful marble, &c. into use in this city.—[Boston Mercantile Advertiser.]